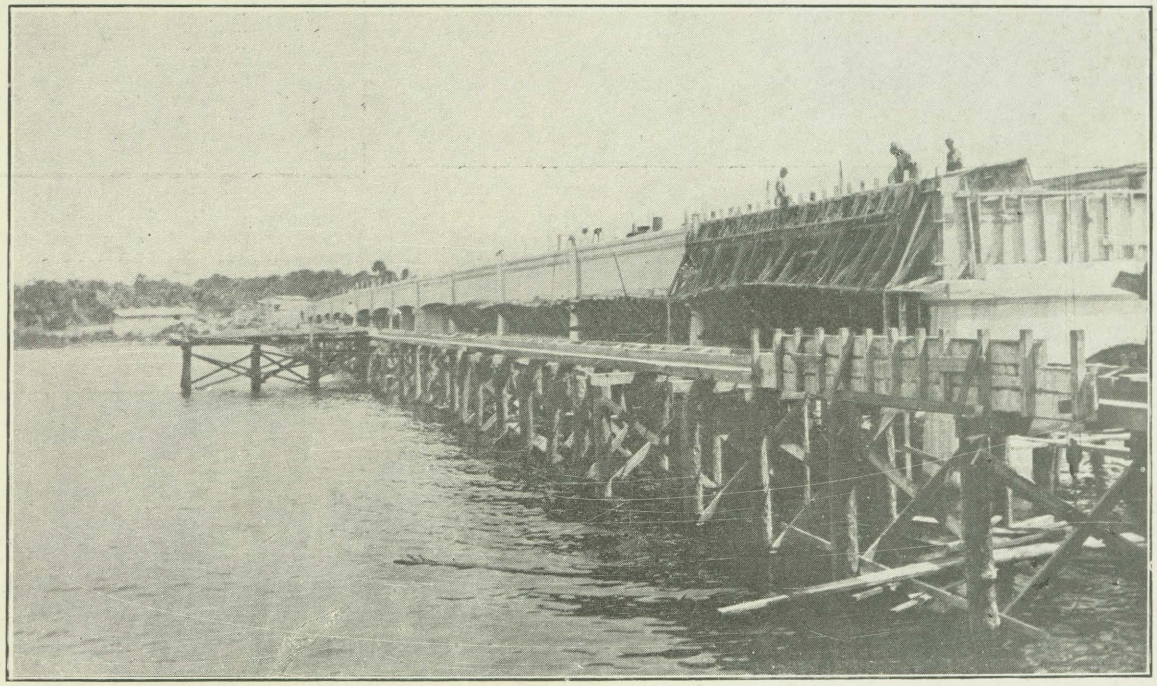
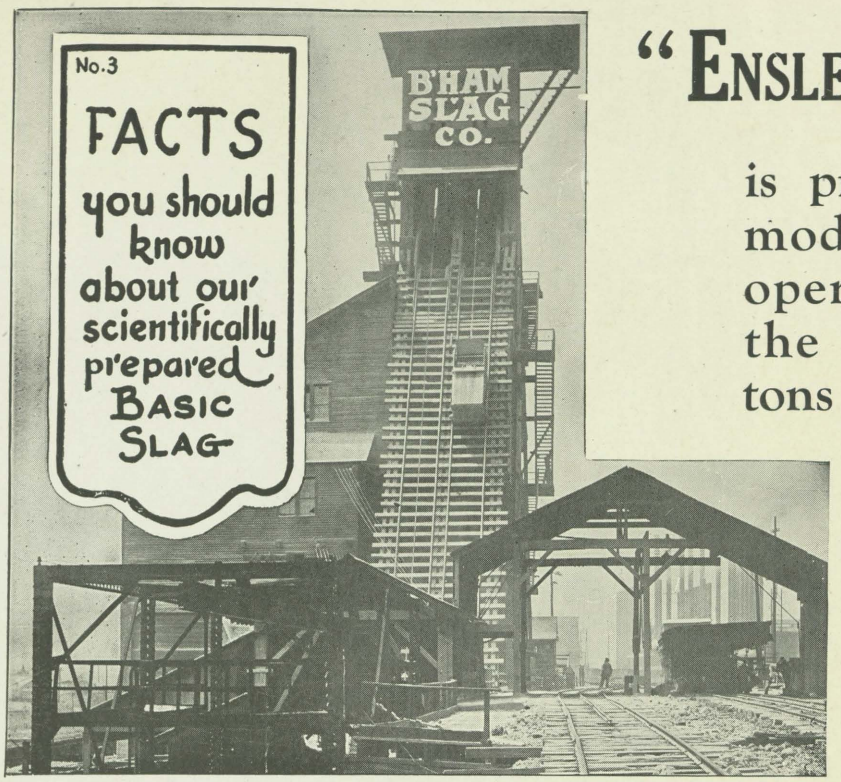
FLORIDA HIGHWAYS



Vol. 1 OCTOBER, 1924 No. 11

PUBLISHED BY THE STATE ROAD DEPARTMENT

$1.00 Per Year Single Copies 10c



"ENSLEY BASIC SLAG"

is produced in this modern electrically operated plant at the rate of 4000 tons per day

STANDARD SIZES

Number	Use	Sizes
*1	For Roads	4" to 2½"
*12	" "	4" to 1½"
2	" "	2½" to 1½"
23	For Concrete	2½" to ¾"
3	" "	1½" to ¾"
34	" "	1½" to ¼"
4	" "	¾" to ¼"
46	For Roads	¾" to 10 mesh
6	" "	⅝" to 10 mesh
*6-A	Washed Roof'g	⅝" to ¼"
7	For Roads	¼" to dust

*These sizes produced at Ensley plant only.

—processes of crushing, screening and sizing to exact specifications

What becomes of the Slag after it leaves the modified pits?

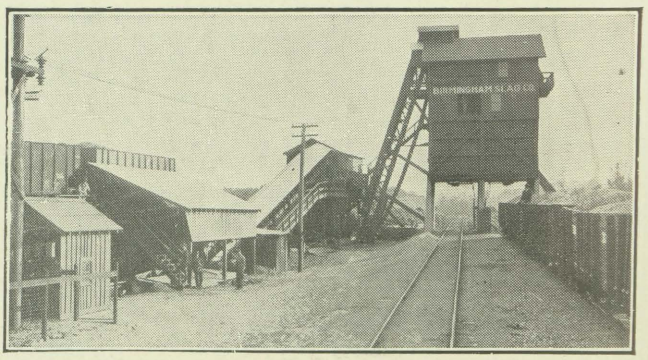
It is brought by electric locomotive trains to a modern electrically operated crushing plant.

Skip cars carry it from the two gyratory crushers up a steep incline to the top of the screening plant and automatically dump it into a big bin.

The crushed Slag then passes over two magnetic rolls, for removal of small pieces of free iron, and into two revolving screens 26 ft. long and 5 ft. in diameter.

The ¾ inch to dust material is first removed from the crusher run slag and passes down chutes to four electric vibrating screens where it is separated into four sizes—Nos. 4, 5, 6 and 7.

After the ¾ inch material has been removed the coarser slag is separated in the big revolving screens into six sizes—Nos. 1, 12, 2, 23, 3, 34. All Slag over four inches is returned to the rebreaker crusher by gravity chute.



Plant No. 2 at Alabama City, Ala.: electrically operated throughout; daily capacity 2,000 tons of "Alabama City Basic Slag."

The sizing completed, the Slag drops into concrete storage bins from which it is loaded into cars directly underneath and weighed on railroad track scales.

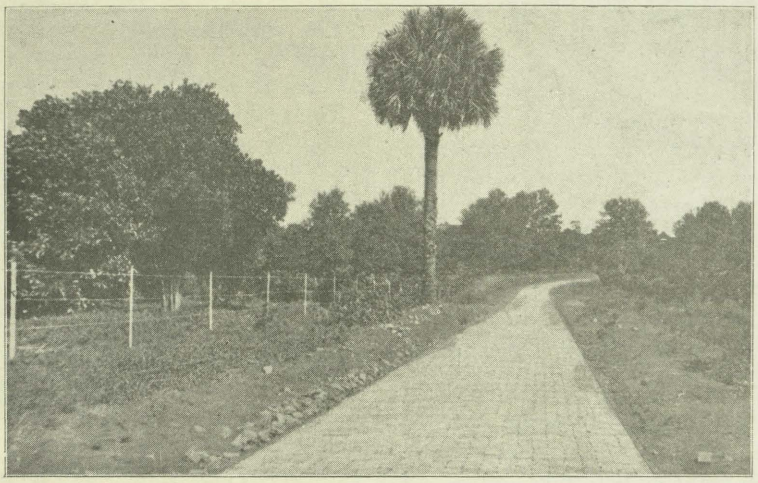
All weights are certified by the Southern Weighing & Inspection Bureau and delivered by our own locomotives to the ten trunk line railroads serving the Southeast. This method saves from two to five days in the handling of every shipment and assures uninterrupted, prompt service—a factor of first importance to every user of "coarse aggregate" and "road metal."

Birmingham Slag Co.

Slag Headquarters for the South

ATLANTA **BIRMINGHAM** THOMASVILLE

FLORIDA HIGHWAYS



Vol. 1 OCTOBER, 1924 No. 11

Governor Hardee Commends the Department

Hon. Cary A. Hardee, who is rounding out his term as Governor of Florida, has addressed to the members of the Department a letter of commendation on the execution of an agreement with the railways of the State touching the safeguarding and elimination of grade crossings. In his letter the Governor touches upon the accomplishments of the Department and reviews its work during his administration. His letter follows:

STATE OF FLORIDA,
EXECUTIVE DEPARTMENT.

Tallahassee, September 25, 1924.

Judge H. B. Philips, Chairman;
Mr. W. M. Corry,
Capt. W. J. Hillman,
Mr. E. P. Green,
Mr. I. E. Schilling,
Members State Road Department,
State of Florida.

I have read with much appreciation the contract recently entered into between the State Road Department and the railroad companies operating in Florida with reference to crossings of railroads by the public highways. Provision is made either for under-passways or overhead crossings, thus eliminating grade crossings. This action will save many lives in the years to come. I feel the opportunity should not pass without saying a word of commendation to you and, likewise, a word of appreciation to the railroads involved for the constructive step which has been taken. When one in an official capacity fails he will certainly be censured. It seems that out of a spirit of fairness when he succeeds he ought to be praised.

Under the contract the expense of crossings, whether they be under-way or overhead structure, will be borne equally by the railroad and the State Road Department. Not only are we to consider the financial side of the situation, but the contract likewise and the developments under it show a spirit of splendid co-operation between yourselves and the railroads. I am told by the chief engineer that in one instance one of the roads affected has gone to the extent of changing its main line of track for a distance of practically one-half mile in an effort to co-operate fully with the Department on this important subject. The people of Florida, especially those who are thoughtful and who desire fair attitude toward every legitimate business interest, it matters not what it may be, will appreciate the action of the railroads in this matter and will likewise commend you in your efforts looking toward the adoption of a far-reaching constructive policy.

The present Road Department has not had an easy task. Notwithstanding the difficulties which have

(Continued on Page Four)

Florida Highways

Published Monthly
Official Publication of the State Road Department

PERSONNEL OF DEPARTMENT

H. B. Philips, *Chairman*
W. J. Hillman — I. E. Schilling
E. P. Green — W. M. Corry
Ella Creary Thompson, *Secretary*

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G. L. Derrick.....Bridge Engineer
C. W. DeGinther.....Ass't Bridge Engineer
Harvey A. Hall.....Testing Engineer
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B. A. Meginniss, Attorney for the Department, Editor and Business Manager

Volume 1 October, 1924 Number 11

EDITORIAL

MAINTENANCE

The emphasis of the present issue of FLORIDA HIGHWAYS, as will be seen from a majority of the articles presented, is upon the subject of maintenance.

The proper and adequate maintenance of a road or bridge is every bit as important as the original construction, for unless properly maintained, the investment in such construction is in great danger of being lost.

The State Road Department is and has always been keenly alive to the importance of maintenance, and in every instance, maintenance crews are placed on the road immediately upon its completion. This procedure adequately safeguards the tax money expended on the State's road programme, and insures the longest possible life for every project. As more and more of the system reaches completion, the necessity and scope of the maintenance programme widens, and the day is not far distant in road circles when the expenditures for this important factor will equal or exceed that necessary for actual construction. To the proper and adequate maintaining of the road system of Florida, the Department has pledged itself.

THE WISDOM OF MAINTENANCE

In no phase of the American scene does the inherent native tendency toward profligacy manifest itself more glaringly than in the attitude toward the construction and maintenance of public roads. Even in the days when the republic was young, and in spite of the influence of the thrifty Dutch and puritannical English, the dissipating proclivities of the United States drew the censure of such noted political economists as Adam Smith and Alexis de Tocqueville. Benjamin Franklin recognized the national trait and preached loud and long the gospel of thrift.

But, alas, the labors of the parsimonious Franklin and the numerous public-spirited citizens who echoed his platitudes have been in vain, for today the American people have gained the unenviable reputation of being the most prodigal on the face of the earth.

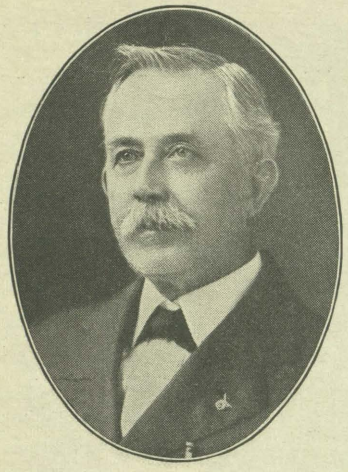
In public work this situation throws its longest shadow. We vote millions in public funds, let us say, for the construction of highways and penuriously close the public chest to demands for funds for maintenance. Fortunately, this condition at present shows some promise of reform. Many years of educational work on the part of road builders has created a more sympathetic attitude toward maintenance, but even now the expenditure of funds for road preservation are not entirely unbegrudged.

The prevailing opinion seems to be that engineers have failed dismally in designing roads when they have failed to produce a type of construction that does not require maintenance. This fallacious logic, I have noted, has been encouraged by pavement purveyors as a means of increasing the demand for their wares.

It is a matter of common knowledge that no type of road in existence today is so excellent as not to re-

(Continued on Page Five)

Chairman's Column



MAINTENANCE OF HIGHWAYS

One of the results of the enormously increased highway traffic of all classes is to bring to the front the vital importance of the maintenance of the road or highway. The old style turnpike which a few years ago carried horse-drawn traffic with some degree of comfort, with but little upkeep or maintenance, under present conditions soon deteriorates and lapses into a state where it ceases to be an adequate means of transportation. The importance of maintenance is little understood by the public and even by many in charge of road building.

The public wants roads and more roads, and wants them immediately. "Give us something quickly over which we may ride," is the demand too often made. They do not understand the folly of building roads that cannot be properly maintained. They do not understand that the county board or the State board should save enough of its resources to maintain all the roads constructed. It is just as much out of reason to expect the modern highway to hold up under present-day traffic, without proper maintenance, as to expect a railroad to smoothly and safely carry traffic without the constant care and work of the section foreman and his squad of section laborers. All this seems entirely plain. There seems to be no excuse whatever for failing to maintain roads, but how many of the county boards are properly maintaining the roads and bridges in their care? How many miles are there in this State which the county boards have allowed to become of little use because of the lack of maintenance? How many bridges are allowed to go, till they become a menace to the traveler, because the proper repairs are not made?

This matter of maintenance should be considered at the very inception of road building. No public road should be built that cannot be maintained at reasonable cost. The competent highway engineer has this matter in mind constantly. He knows the road should be maintained. He knows there must be proper drainage of the road, and so he seeks a location where such drainage can be had. He knows he must have a sufficient width of right-of-way in order to get the proper width of grade and ditch lines so that the road bed and shoulders may be maintained, so he insists on a wide right-of-way. He knows that in this State you just cannot properly maintain any type of road built on a right-of-way only thirty feet wide, so he condemns the old-fashioned thirty-foot right-of-way. Everything about a properly planned and constructed highway should be permanent, except the wearing surface. The location, alignment, drainage structures, grade and base should be permanent features of the highway. Any surface placed on a highway where there is much traffic will in time wear out and must be renewed or maintained, but there should be no disturbance of the base or subgrade, and in order that these features may be kept intact conditions must be such that the shoulders and drainage may be maintained.

Why issue thirty-year bonds and with the proceeds build ten-year roads? Yet, that is just what has too often happened, because this thought of maintenance was lost sight of at the time the road was planned and constructed. This matter of road maintenance rests largely with the public. At present the people are not helping much along this line. Too many are insisting that roads be so located and built that they cannot be properly maintained. This matter should receive more thought and consideration by those who are paying the cost of road building. Let them insist first that all the roads built shall be such that can be properly maintained at a reasonable cost; second, when such roads are built, that they shall be maintained. Let them be just as insistent about the maintenance of roads as they are about the construction of roads, and we will come nearer to getting and enjoying an efficient system of highways.

ROAD MAINTENANCE EXPENDITURES

Expenditures for highway maintenance are reaching huge proportions. Some of the older Eastern States already spend more annually for upkeep of old roads than they do for building new roads. Throughout the country the practice is the reverse. The vast majority of States have only begun the construction of the improved roads which traffic requires. Their construction account looms large not only in actual figures but in the concern and consideration of the people. These facts have served to overshadow in public thought the growing magnitude of the public-road-maintenance business. It is growing up unobserved. Excluding interest on funded debts for road construction, about 40 per cent of the present expenditures for highways is for maintenance. This percentage is based on the latest complete records of 1922. They are worth noting. According to the Bureau of Public Roads the highway expenditures for 1922 were $617,000,000 for construction and $245,000,000 for maintenance. About 30 per cent of all maintenance expenditures are for the 220,000 miles of State system highways, which

(Continued on Page Twenty-three)

GOVERNOR HARDEE COMMENDS THE DEPARTMENT

(Continued from Page One)

confronted them, they have stayed on the job and have moved a long way in road construction and in adoption of stable policies. Some time ago in a public address I stated that no State in the Union had a better road department than Florida. I believe that to be absolutely true. Let us note briefly some outstanding facts in support of the statement. Logically, it seems to me the Department should be measured by these policies which it has been responsible for and by the work which has been accomplished in actual and projected construction during the brief period of the present Department's tenure of office.

Finances

When the present members assumed management the Department was in a chaotic stage. It had no financial policy and instead of finding reasonable working balances in its treasury it found a deficit of several hundred thousand dollars of unpaid bills, all clamoring for immediate payment. The present Department also found commitments and contracts on the part of their predecessors, many of which seriously handicapped effective work under the present administration. You have financed the Department and placed it upon a sound financial basis. You are now raising your revenue almost entirely from the automobile license tag law and from the tax on gasoline sales. The levy on advalorem property has been reduced 50 per cent from what existed when you assumed charge. The present policy of financing the Department and for the development of which you should be largely credited, works no serious hardship on the people and is easily and agreeably met by them.

Policy in Construction

You found upon assuming office no definite policy in road construction. Work was contemplated and undertaken in a more or less hotch-potch manner, here and there about over the State, and without much reference to the construction of main arteries over which the tides of travel might pass from one section of the State to another. Legislative sanction has been secured for concentration of work upon several principal highways and which will give us, in co-operation with the Federal system, an excellent system of State highways. Under this law, and for which the present Road Department is largely responsible, the work has been concentrated upon main designated roads. There has been a clamor for such a policy, but it remained for the present Department to carry it into effect and actually see its accomplishment.

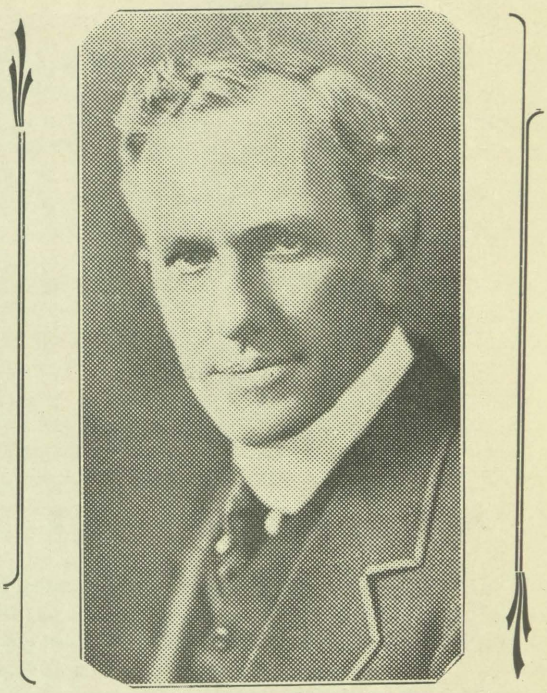
Work Accomplished

Following your induction in office, something like three and one-half years ago, it necessarily required considerable time in the formulation of policies, in the raising of necessary revenues and in the building of an organization for the task at hand. Notwithstanding this, there has been a great deal of accomplished work. About 500 miles of road built and hard surfaced (none finer or better to be found in any of the States about us); more than 300 miles of cheaper type of construction, such as sand-clay, etc., to say nothing of graded roads. In addition to this, twenty-two concrete bridges, with a total length of 9,833 lineal feet, or nearly two miles of concrete construction. Seven timber bridges with a total of 13,216 lineal feet, have been constructed. This work has been distributed well over all sections of the State and, of course, does not include a good deal of other foundational work done on other various projects. In addition to the actual work done by the Department it has rendered untold service to the counties in their local road construction. The Department has freely and gladly co-operated with the counties in engineering advice and has in numerous instances been the means of conserving funds of the individual counties, whereas, but for such service, much of the county's fund would have been practically wasted, as was the case in so many instances a good many years ago in our early period of road construction. The Department has also been instrumental in securing for the counties more or less equipment, which has been of inestimable value to them.

Criticism

Every road department in the United States has had to suffer more or less criticism from the public. In conversation with quite a reputable gentleman some little while ago who had just returned from a visit to one of the States that has a reputation for having done more road construction than any Southern State, I was not surprised to hear him say that

FLORIDA'S DISTINGUISHED CHIEF EXECUTIVE



HON. CARY A. HARDEE, Governor

wherever he went in that State he found the people not all satisfied with the road department and, likewise, much tendency to criticise them. Such criticism as has been directed toward the Department during your administration has largely resulted because the people were not in possession of all the facts and did not have full knowledge of the problems which were confronting the Department or the vast amount of work which they were trying to carry through. Some of it, perhaps, has resulted on account of the jealousies of different communities. On the whole, I think it has been rather negligible. The people have confidence in the business ability, the honesty and the judgment of the members of the Department and, I am sure, there exists a general feeling that they are doing well with the work at hand.

Yours very truly,

CARY A. HARDEE, Governor.

THE WISDOM OF MAINTENANCE

(Continued from Page Two)

quire maintenance. The future may bring forth such an one but it is with the present that we have to deal.

The American traveler, fresh from a motor jaunt through Scotland, England or Continental Europe, is the most carping critic of the road systems of this country, and, in the same breath, presents one of the strongest cases for efficient road maintenance. He praises the highways of France, Germany and Switzerland, of Belgium, Holland and England.

Such is true but the high quality of foreign roads is not the result of primary design but of decades of continual, efficient maintenance. The majority of these roads are of macadam construction and their high degree of perfection has been obtained by the making of needed repairs day by day. The road maintenance worker of France is as common in that country as the motor officer is in this. Armed with a small hammer, similar to that used by geologists, he tramps along his allotted section of road, filling surface ruts with stone from frequent roadside stockpiles and smoothing the filled surface with his hammer. For repairs beyond his facilities special crews are always available.

It is useless for us to lament the condition of American roads until we take the problem of maintenance as seriously as does the European. Manifestly our roads do not require such treatment as do French roads but we must realize that a much more intensive maintenance program must follow the construction of a road than has in the past if our tremendous investments in public highways are to be conserved.—Western Highways Builder.

FINDING ROCK IN SWAMP LAND

Scarcely a day passes that some new evidence of hitherto unknown resources of the South does not come to the front. In the Daytona (Fla.) Journal of August 24, Dr. G. M. Randall gives an interesting account of the discovery of rock in what was only a few months ago, before a drainage canal had been constructed, thought to be merely swamp land. This land was overflowed the greater part of the time and not even suited for pasturage. Nobody had ever suspected that underneath the surface there lay a large amount of valuable rock, but last year a drainage canal was completed, opening up about 7,000 acres of this overflowed land for development.

On one tract, which has recently been purchased by local people, Dr. Randall says that after scratching off the top soil, one finds a stratum of lime rock as hard as flint. This is about two feet thick. Under the lime rock he reports there is a layer of marl, and under this a layer, or stratum, of sand, and under this layer of sand another stratum of rock but of a different character from that on top. That portion of it which has been exposed is, he says, as hard as flint and the line of cleavage or fracture is sharp as glass. This is entirely different from the coquina, or soft rock, which is found in large quantities in that section. The lime rock is said to carry 90 per cent of calcium of lime and 5 per cent of iron, with the balance of silicon and other mineral elements.—Manufacturers Record.

PLANS WELL ADVANCED FOR 1925 ROAD SHOW AND CONVENTION

The 1925 Road Show and Convention of the American Road Builders' Association will be held at Chicago, January 5 to 9, inclusive. C. M. Upham, business director of the association, announces that much better arrangements have been made for both the show and convention than in any previous years. The preliminary plans also are already as far along as has been usual at a much later date. Every indication, therefore, is that these two big annual events in the road building industry will in every way eclipse all past records.

The program committee which will have charge of the convention will be headed by Prof. T. R. Agg. He expects to have the organization of his committee completed soon. Professor Agg has had such a variety of experience in the highway field that he will be able to produce a well balanced program of general interest. The convention sessions will be held at the Congress Hotel.

Nearly 17,000 square feet of additional floor space suitable for heavy exhibits will be provided at the Coliseum. This additional space is being obtained by the extension of the Coliseum to the north. The present main building and the adjoining building which have been used in the past also will be available. There will thus be room for more and better exhibits than in the past.

Additional doors for bringing in the heavy exhibits also have been arranged. Plenty of time to get the exhibits into the buildings further will be allowed by the schedules made possible by the dates of the show. These improved arrangements coupled with the wonderful success of the last two road shows insure the largest and best industrial machinery exposition ever seen in this country.

Application blanks for space in the Road Show will be mailed shortly by Mr. Upham to all concerns whose names are available. Additional blanks may be obtained by addressing him at 37 West 39th Street, New York City.

Committees are being formed to handle the annual banquet, hotel arrangements, registration and various other features. The plans for these features, as well as for the show and convention, will all be arranged long in advance of what has been customary in previous years.—Roads and Streets.

Routing Our Through Motor Travel

By Alvan Macauley, President of the Packard Motor Company and Member of the Traffic Planning and Safety Committee of the National Automobile Chamber of Commerce.

Half the motor vehicles in the United States are owned and largely operated in urban communities of 5,000 population or over. Very close to one fourth of all the motor vehicles in the United States are owned and operated in the 68 American cities having populations greater than 100,000.

As every motorist knows, a very small—much too small—proportion of the streets in the average American city carries a very large proportion of the total traffic volume. The reason is that most of our American cities, in common with most cities everywhere, are very poorly planned, or rather they were not planned at all but, like Topsy, just grew. I believe you can count the American cities which were really planned —that is, laid out on paper before they were built— on the fingers of one hand, and those that actually adhered to the original plan are still fewer.

American cities, with the increasing tendency to go up into the air instead of spreading out in area, are confronted with problems unique to this country and to this present motor age of ours. Communities in every section of the Union, confronted with what amounts practically to a stoppage of traffic flow due to congestion in their business districts, are appointing or employing city planning commissions and undertaking to do now what should have been done years ago.

Many of the measures of relief suggested by city planning experts, such as the broadening of downtown streets, the opening up, through condemnation and demolition of existing buildings, of new arterial routes, the elimination of tragic grade crossings and the installation of elaborate systems of traffic control, cost a very large sum, and in the majority of our cities cannot be put into immediate operation to any appreciable extent because of the expense.

But, fortunately, one very important move which will do much toward lessening the present traffic congestion in our cities and which will go far toward preventing unnecessary increase in congestion in the future, can be made at this time by our muicipalities practically without expense to them. It might be said that this important remedial measure can be effected almost without positive effort on the part of our towns and cities. About all they need to do is to refrain from active opposition to the plans of State and Federal highway authorities, now engaged in the tremendously important task of routing the through traffic lines of America and correlating them into State and Federal highway systems which will guide the traffic flow of the future.

While we have no choice in most of our cities but try and accommodate this generation's traffic on last generation's streets, we are fortunate in this, that we are just beginning to build this generation's highways to carry next generation's interurban traffic. It is our present job to see that this is properly done, not only in the interest of the travel but in the interest of our cities.

Now Building for Tomorrow's Traffic

Right now the foundation lines of a national highway system are being laid. The great plan which will gradually, during the next fifteen or twenty years, be translated into a new national transportation system, is being laid out on paper. Ten thousand miles of arterial roads are being built each year. But we still have a long way to go to complete even the first ten per cent of America's most necessary highways over which our increasing millions of motor vehicles will flow for all time. There is yet an opportunity to direct this flow with foresight.

Since 1921 when the Federal Highway Act was passed by Congress and the correlation of State systems into an interstate system of national benefit began, our State and Federal road authorities have been busily engaged in laying out the roads which experts figure will carry over 80 per cent of the highway traffic of the union. They have been and still are trying to do this with vision, with an understanding of what the future will bring.

It seems surprising that these State and Federal commissions, whose jurisdiction ends with municipal limits, should have had until recently so little active co-operation from American cities in carrying through their plans.

I believe it is a fair statement of the case to say that 90 per cent of the difficulties encountered by our State highway departments in the planning of adequate systems of intercounty roads, have resulted from the conflicting objections put forward by the communities these roads are to connect and serve. Left alone, the majority of our State highway departments, with the aid and co-operation of the Federal Government, can, with a State and National viewpoint on the traffic situation, lay out a system of arterial highways which in addition to serving interurban traffic most efficiently, will go far toward relieving many of the ills from which the majority of American cities suffer.

I am familiar with the difficulties which have confronted many State highway commissions in trying to lay out plans which they knew were wise and in the best interest of all, while at the same time endeavoring to placate disgruntled communities, not suited by the locations selected for the main highways. It would be hard to estimate how many thousands of miles of proper highway construction have been delayed and prevented through inter-county and intercity dissension relative to location. The voting power of the cities in every State is considerable and the influence wielded by communities which wish to pull and haul the State road program to their fancied

THE NEXT GOVERNOR OF FLORIDA



Hon. John W. Martin of Jacksonville, a Native Floridian, who by virtue of his victory in the Democratic Primary will be Florida's next Chief Executive

local advantage, can do much to block any proper rate of progress.

Keeping Through Traffic Out of Town

Our cities have just begun to wake up to the fact that it is not an advantage, but a decided disadvantage, to debouch into the maelstrom of their downtown traffic the through travel which has no desire whatever to be tangled up in city congestion, hampered and delayed by its necessary regulations and led by devious windings through main streets of business blocks where it does not wish to stop. Through traffic and intra-city traffic should be, insofar as possible, absolutely separated, and it is odd that this apparently simple truth is only now beginning to be appreciated by the business and civic authorities of the average American community.

I can remember when we were laying out the Lincoln Highway eleven years ago, as a main line for what we conceived would be the ultimate American highway system, we considered this question of through traffic very carefully. Eleven years ago the registration of motor vehicles in the United States was 1,258,000 and the density was one vehicle to every 73 people. Motor vehicle traffic naturally was not then a problem. Heavy through passenger traffic was forseen by but few. Interurban freight transportation was a dream. But the founders of the Lincoln Highway, most of them connected with the automotive industry and in a position to visualize the present marvelous development of highway transportation, endeavored to set an example in the routing of the Lincoln Highway between New York and San Francisco, by leading it around or near, instead of through, large centers along the line.

We felt that as this highway developed and long-distance travel east and west across the continent became heavy, it would be mutually disadvantageous to the through travel and to the communities on the Highway to have this through traffic traversing the main business streets of each of the many centers on the Lincoln Highway.

We were endeavoring then to gain co-operation from the communities along the proposed line and of the county authorities. There were few state highway departments in 1913.

The farsighted policy of the Association's founders, far from meeting with the approval of the authorities or the business men of the communities near the projected route, raised a storm of disapproval.

Every community between New York and San Fransisco near the line selected for the first transcontinental highway, fought with avidity to have the route marked to follow through its main streets—through the heart of its downtown district! Communities less than a mile off the proposed line opposed or were apathetic toward the whole project because it did not bisect their particular bailiwicks. It is

difficult to estimate to what extent the progress of improvement on the Lincoln Highway was delayed in some states through the antagonism developed or the apathy resulting in certain influential centers of population because the route did not traverse the business districts of such centers and pass the doors of the commercial establishments.

As years passed and realinements on the Lincoln Highway became possible, the original location was slightly revised here and there in the process of shortening and, as a result, many communities originally on the route were bypassed. In each such instance the Association's board was deluged with protestations, visited by communities and strongly censured when it held to its original policy of missing every community posible.

Garnering the Tourist Dollar

Of course the theory back of all this agitation—and this same situation resulted along all of the main roads of the country as they gradually developed—was that the through traffic was a great business asset and as it grew it would leave hundreds of thousands of dollars in the communities during every touring season. That theory is partially correct.

A location on or near the route of an important interstate highway is undoubtedly as valuable to the average community today as was a location on a railroad forty years ago. There are smaller centers the very lifeblood of whose business is the transient motorist and it is only natural for even the largest cities to desire adquate and well-paved highway connections which will make it easy and convenient for the American motorist to visit them and patronize their hotels, their garages and their merchants.

But the advantage of a location on a railroad do not accrue as a result of having the main line run immediately through the heart of town. Quite the contrary. Those cities sufficiently unfortunate to have main line railroads through the heart of their business ditricts and their congested centers know what a problem this presents. It means a dangerous grade crossing every block or a tremendous expenditure to put the railroad underground or to separate the crossings. Those cities are most fortunate which lie within a belt of rails and the travelers who arrive by train make no objection to covering the distance between the depot and the hotel or the place where they would do business.

By-passing the "Express" Traffic

The analogy holds true as applied to our main line highways. And it is interesting to note how the passage of years and the development of American highways and highway transport have changed the municipal attitude toward through route construction and alinement. There is hardly a metropolitan center along the Lincoln Highway today which is not making a strenuous effort to have adquate by-passes provided for the tremendous volume of travel which it is now recognized should not be allowed to add to the growing congestion of busy business streets.

At last the Lincoln Highway Association and other organizations interested in the development of through routes of motor travel can, with the co-operation of the communities involved, mark the through routes along the edge of a city, or if necessary, along little used streets, instead as in the past being frequently opportuned to divert the through traffic away from the direct line in order to wind it through the very heart of town. Even those communities which lie directly in the path of important transport arteries are beginning to see the wisdom of developing a turnout or runaround for the through travel, which will make it unnecessary for it to enter the community at all unless it so desires.

The time has come for city planning commissions and civic authorities in general to co-operate in every way possible with the state highway authorities in an endeavor to keep every possible motor vehicle which has no business in town out of town. The modern tourist knows where he is going. He probably is traveling on a schedule which calls for a stop at noon at a certain point and at night at another. He is not necessarily a potential customer in every community he traverses. In downtown business streets he is not an asset but a liability. Traffic congestion in the shopping districts of metropolitan areas has a serious detrimental effect upon the busines done in the stores which line the business thoroughfares. The heavy through traffic which makes it difficult for the local folks to patronize their own merchants has proven a boomerang to those who have insited on leading it by their doors.

Pittsburgh's Experience

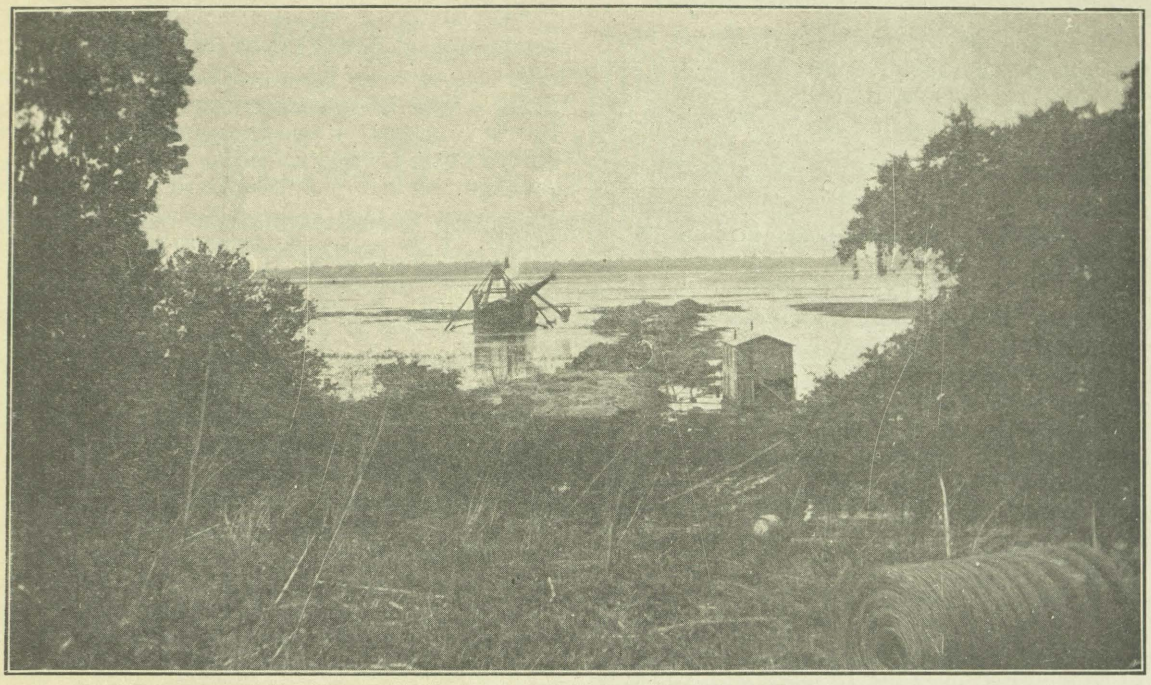
A recent census taken in downtown Pittsburg on the Lincoln Highway showed that some 20 per cent of the vehicles represented the through travel which did not want to be in that part of Pittsburg at all and which, had it been possible, would probably never have entered the city. Given a good bypass around Pittsburg and a very considerable alleviation of her downtown difficulties can be expected. Yet certainly all of those travelers who may wish to enter Pittsburg to stop at her hotels or buy at her stores will do so. Only those who do not wish to stop will not enter and they are not wanted.

It is interesting to note to what lengths those of our cities which have been studying this situation, will now go to get the through traffic out of their business districts. If anything, these lengths are greater than those to which these selfsame communities went but a few years back to get the traffic in. It isn't a case of too much of a good thing. It never was a good thing. It is just a case of our cities beginning to wake up to a fact which was appreciated from the start by those who were close to the problem, as being a fundamentally wrong and unscientific way of handling the situation. Through traffic never did do a community any good. The only traffic which does a community any good is the traffic which stops and when it stops it ceases to be through traffic.

What New Jersey Is Doing

Major W. G. Sloan, state highway engineer of New Jersey, recently outlined New Jersey's plan for a complete relocation of the Lincoln Highway from the Jersey City side of the Hudson, at the west end of the vehicular tunnels now being built to connect Manhattan Island with Jersey, through the Newark meadows south of Jersey City and Newark to Eliza-

(Continued on Page Ten)



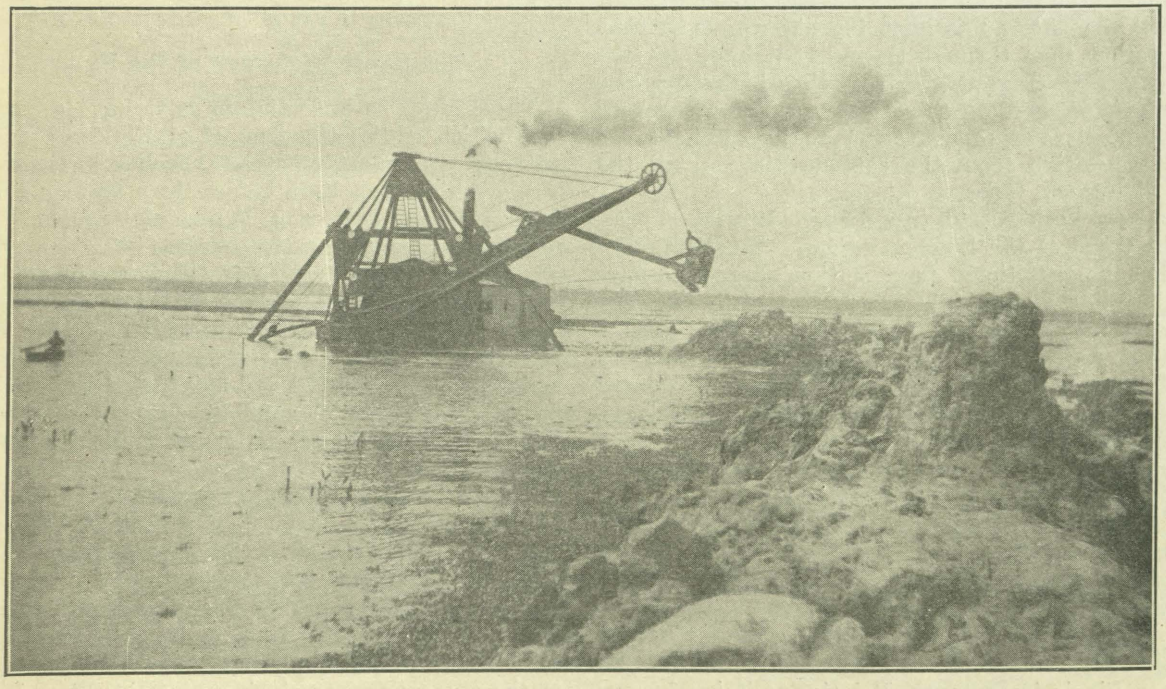
PAYNE'S PRAIRIE

The photographs on this page show the big dredge of the Florida Drainage and Construction Company at work on the fill across Payne's Prairie on Road No. 2, Alachua County F. A. Proj. 37-D, five miles south of Gainesville.

When completed this fill will be two miles in length, 30 feet in width on top, and 90 feet in width on base. It is the means of a saving in distance of five miles between Gainesville and Micanopy, a distance of 12 miles.

The dredge shown in the picture works night and day and can handle approximately 2,000 cubic yards of material in that time. This dredge is 30 feet wide and 80 feet long and has a 2½ yard dipper on a seventy foot boom. The material going into this fill is sand and sand-clay, but no muck as would be expected comes from the bottom of this prairie.

Road No. 2 has been built up to the end of this fill on each side of the prairie. As soon as it is completed, a substantial guard rail will be placed on each side of the road and it will then be opened to traffic. This will probably be in the early spring.



ROUTING OUR THROUGH MOTOR TRAVEL

(Continued from Page Eight)

beth. "The essential consideration," Major Sloan says, "as with all such motor trunk highways, is that it shall, insofar as possible, lie outside of towns and cities and be so located as to reach existing or potential industrial centers."

The present Lincoln Highway through Jersey City and Newark is heavily congested, to a large extent by motor truck traffic. The congestion is expected to increase tremendously upon the completion of the Hudson River tunnels and the bridge over the Delaware connecting Camden with Philadelphia. Today the average count of vehicles entering Newark on the Lincoln Highway is 16,930. The plan now nearing completion is to provide a tunnel, a subway, or an open cut, from the Passaic River, blasted through hard trap rock through south Jersey City at enormous expense, and the construction of a new grade with a minimum width of 50 feet and with a heavy concrete pavement across the Hackensack meadows south of Newark.

The State Highway Department of New Jersey expects to expend some $25,000,000 on the construction of this link and estimates the maximum hourly count to be expected over the 13 miles of highway at 5,500 vehicles. Major Sloan says that this volume of traffic is more than twice the traffic on Fifth Avenue at 42nd Street in New York City. In Jersey City local traffic will pass over the cut or tunnel which will contain the through highway. There is probably no better example in America at this time of the lengths to which it is worth while to go to eliminate the through traffic from the congested portions of metropolitan areas.

Making Cities Way-Stations Instead of Terminals

A recent editorial in a Kansas City paper commented with some surprise upon the fact that the State Highway Department of Missouri, in laying out a main market route a short time ago, found certain towns that preferred to have the highway pass near them rather than through them. It pointed out the obvious traffic advantages in having highways pass around cities, as the State Highway Department of New York is now endeavoring to do, without too great opposition from the communities, on all the state highways.

The New York World, in a recent editorial, expressed the trend of the times in saying: "Because cities dreaded the traditional 'way station' status we have been building motor highways from city to city, discharging traffic into the heart of the towns with a resultant delay of through traffic and unnecessary interference with local traffic. When the advantages of the way-station status are more fully appreciated, motor highways will skirt the towns instead of passing through. Belt-line motor routes will parallel the railroad belt lines. The way-station ideal is alive in New York, with talk of elevated marginal ways to make midtown New York a way-station for traffic from lower to upper Manhattan. We need to study and work along these lines."

It is not only in the metropolitan centers that this question of getting the through traffic out of the local traffic is important. Relatively, it is of equal importance in the smallest community which now finds continous streams of passenger cars and motor trucks rumbling through "Main Street" not only dangerous but disconcerting, expensive and profitless.

American cities have had a tendency to centralize along a first main business street and later along a few such streets. Few of them are now laid out with an eye toward decentralization of traffic and a great problem lies before America's communities in taking steps now to take care of the still greater coming traffic. Now is not too early to plan for the accommodation of the traffic of 1950.

Motor Transport Development Just Well Started

The development of American roads is just beginning to reach the point where the fullest use and efficiency of the motor vehicle can be realized. As our interurban roads are improved, the problem of providing adequate by-passes or city avenues of traffic for the through transport which will develop in the future will become more and more pressing and its solution more and more expensive. Steps taken now in the planning of the future development of American cities and with an eye on the provision of through transport arteries will pay big dividends to the next generation.

South Bend, Indiana, a community of 70,000 population on the Lincoln Highway, typical of hundreds of like communities on main routes of travel in every section of the Union, has been having its difficulties with the traffic problem. Recently a Chicago city planning engineer was called in to study South Bend's street problems and report to the Chamber of Commerce. One of the first recommendations made to the city authorities was the re-routing of the Lincoln Highway, now following one of the principal business streets of the city. In his report this traffic expert said: "My suggestions are predicated on the theory that Lincoln Highway traffic is through traffic and that it should be so routed as to take it out of local commercial traffic lanes so far as possible, yet leaving the business area thoroughly accessible to it."

The Super-Highways of the Future

Those cities so unfortunate as to have a "center" into which eddies the flow of traffic from a dozen converging, important streets, each continuations of through highways, have before them particularly difficult problems. Detroit is one of these, and in its recommendations recently presented to the city council, Detroit's Rapid Transit Commission, under the chairmanship of Col. Sidney D. Waldon, points out how unfortunate it is that the plan for the city of Detroit laid out by the Governors and Judges in 1806, which provided for 120 and 200 foot streets and great radial arteries for through traffic, superimposed on the usual checkerboard pattern, should have been discarded. Detroit is the gateway to Michigan from the south and east, and every effort is now being made to route this heavy flow of through travel along the city's outskirts on a "super-highway" 204 feet wide, elevated over the cross streets and with an express and local traffic capacity of 8,600 vehicles per hour in each direction, which will permit motor vehicles to average 30 miles an hour, or better, instead of the present five or six in traversing the city.

Figure out for yourself how much better time you could make and how much more pleasant a trip it would be between New York and Chicago if in that tour of over 900 miles you did not necessarily have to traverse one single municipality and yet were always within convenient distance of any in which you wished to shop, eat, or spend the night.

Looking Ahead Now Will Pay

Our great arterial roads of the future, which will rumble all night with heavily laden trucks and carry their daily quota of through passenger traffic running into the tens of thousands of vehicles, will largely necessarily follow the rights-of-way and the grades established now. Now is the time to lend every possible support to those authorities endeavoring slightly in advance of public opinion to correctly route these new transportation utilities.

The combined motorists of America can have tremendous influence in this development, and it is a matter of the greatest importance to them. We all of us realize that in many of our larger cities the automobile has become almost useless in the downtown section, where one can make better time on foot and be untroubled with the ever-present problem of finding a place to park.

When there are 25,000,000 motor vehicles registered in this country, as there surely will be by 1934, we will find the efficiency of our own car or truck vastly decreased if we do not look ahead now and plan wisely to prevent further metropolitan congestion and the consequent increase in hampering ordinances and regulations which tend to make the operation of a motor vehicle in our American cities an ordeal rather than the pleasure and convenience it should be. —American Motorist.

BRAKE LININGS

Every motorist starting on a camping trip should take his car in to the nearest service station and have his brakes relined. Accurate adjustments of the brakes are also vital necessities on a cross-country trip. Don't wait until the car needs new brake linings—do it before you start off, then you not only save, but are safe.

WINDSHIELD CLEANERS

Every automobile should be equipped with a windshield cleaner or wiper. They are absolutely necessary for both comfort and safety. In rain or snow it is impossible to keep the windshield dry and unobscured to the driver's vision. Safe driving under these conditions is out of the question without such a device. They range in price from $1 for the hand-operated one to those that work automatically and by power from the exhaust or electrically driven up to $15.

PENETRATE FOG

If you are ever caught in a heavy fog, take white handkerchiefs and place them over the lamps of the automobile and the handkerchiefs will act as a screen to penetrate the fog. In the fall we will begin to run into some very heavy fogs and this is a good thing to know.—Illinois Motorist.

UNIVERSITY OF MICHIGAN OFFERS FELLOWSHIPS IN HIGHWAY ENGINEERING AND TRANSPORT

The Board of Regents of the University of Michigan will award the following Fellowships not later than Nov. 1, 1924. Two Fellowships may be awarded about Sept. 10 to men who intend to be in residence during the first semester.

The Roy D. Chapin Fellowship in Highway Transport, which is offered to provide for the investigation of an approved subject relative to highway transport.

The Roy D. Chapin Fellowship in Highway Engineering, which is offered to provide for the investigation of an approved subject relative to hard-surfaced roads and pavements.

Two Detroit Edison Fellowships in Highway Engineering, which are offered to provide for the investigation of approved subjects relative to moderate-cost country roads.

General conditions: Each Fellowship pays the sum of $250, with an allowance of $50 for expenses. Fellows do not have to pay tuition fees. A Fellow must hold a Bachelor's degree from a college of recognized standing. He must enroll as a graduate student in highway engineering or highway transport, and as a candidate for the degree of Master of Science or Master of Science in Engineering. He must be in residence for one of the following periods: First semester (October to February), winter period (December to March); second semester (February to June). An application for a Fellowship must include a concise statement of the candidate's educational training and engineering experience, and three references.

During the months of December, 1924, to March, 1925, inclusive, the University of Michigan will offer nineteen professional short period courses in highway engineering and highway transport. Each course will consist of thirty lectures, will be given in a period of two weeks and will count as two hours' credit toward the total of twenty-four hours required for the Master's degree.

Applications for Fellowships should be sent to Professor Arthur H. Blanchard, 1026 East Engineering Building, University of Michigan, Ann Arbor, Mich.

NOT SO DUSTY

A city business man was very keen on having proficient clerks in his employ. Before a clerk could enter his office he was required to pass a written examination on his knowledge of business.

At one examination one of the questions was: "Who formed the first company?"

A certain bright youth was a little puzzled at this, but was not to be floored. He wrote:

"Noah successfully floated a company while the rest of the world was in liquidation."

He passed.—London Answers.

An editor was dying, but when the doctor bent over, placed his ear on his breast, and said, "Poor man! Circulation almost gone!" the dying editor shouted: "You're a liar! We have the largest circulation in the country."—Sefton Magazine.

Road Maintenance Problems

RESULTS OF AN INVESTIGATION AND STUDY OF SEVEN DIFFERENT ROAD-MAINTENANCE PROBLEMS

The maintenance committee of the Advisory Board on Highway Research, Division of Engineering, National Research Council, during 1923 made an investigation and study of seven different road-maintenance problems, some of which are reported in abstract below:

Gravel Corrugations

Dr. George E. Ladd, economic geologist for the U. S. Bureau of Public Roads, has made a study of gravel corrugations. Questionnaires were sent to all the highway departments in the United States, and replies were received from 32 States. The consensus of these replies was that corrugations form in all gravel roads when the traffic becomes 500 to 600 vehicles per day. The formation of corrugations is in no way dependent upon construction or maintenance methods. Corrugations are most apt to occur on flat grades. Two general reasons were assigned for the formation of corrugations: first, actual kick-back of material due to the spin of the drive-wheel returning to the road surface after a bounce caused by an unevenness in the surface of the road; second, displacement of material due to impact of the wheels, both front and rear, after the bounce. This displacement is accentuated in rainy weather by the splashing of water, which carries away the binder and fine material from the corrugations.

Any slight unevenness of the road which reacts on the springs of passing cars may cause a series of corrugations. When the unevenness is hit by a passing car, the springs are at first depressed; they then expand and virtually lift the weight of the car from the road. In some cases the wheels of the car actually leave the road surface; then the springs come back to normal, and the weight of the car is impacted on the road surface. If the road is wet, a slight indentation is made; also, as the drive-wheels are spinning, material is kicked back from the point of contact, and a depression is thus started. After this depression has started, it grows rapidly and other depressions are formed in a similar manner until we have a complete series. On flat grades during rains the depressions collect the water which is splashed out by passing vehicles, taking with it quantities of road binder and fine material.

The States were almost universally agreed as to the method of cure of corrugations: blading or dragging with heavy equipment soon after rains, while the gravel is still moist, supplemented by occasional scarifyings, seems to have produced the best results. It should be noted that this cure is not permanent, but lasts only until the next rain.

Surface Treatment of Gravel Roads With Refined Tar

The Michigan Highway Department has continued its research in this subject through the year and has surface-treated with refined tar approximately 45 miles of well-constructed gravel roads carrying a traffic of from 800 to 1,500 vehicles a day. The method of surface treatment which they have adopted is, briefly, as follows: The work is started early in the spring, when the frost is coming out of the ground. The road is first shaped up and the gravel allowed to consolidate. As soon as it is fairly well dried out, it is swept and an application of 1/6-gallon of a refined tar per square yard is applied and allowed to penetrate into the surface. As soon as the surface takes on a brown appearance, approximately 1/3-gallon per square yard of the same cold material is applied and immediately given a top dressing of pea gravel or slag screenings. The Michigan Highway Department emphasizes the fact that the success of this kind of work depends largely upon the maintenance given the road, both before and after the treatment. Surface breaks are taken care of as fast as they occur. They are filled with a cold mixture of refined tar and coarse gravel. These patches are struck off and smoothed with a flat-bottom shovel.

The Wisconsin Highway Commission has also treated a large mileage of gravel roads with refined tar, and reports satisfactory results. The Wisconsin method of treatment is similar to that used in Michigan. The road is first scarified and smoothed and allowed to compact. It is then swept and an application of cold tar applied from shoulder to shoulder, 1/6-gallon per square yard. The road is then opened to traffic for 24 hours and 1/3-gallon of cold tar per square yard applied and lightly sanded, using about 15 cubic yards of sand per mile for a 20-inch width. The travel is then allowed to use the road and in a few days a second sand coat is applied, using about 35 cubic yards per mile for a 20-inch width.

For patching, a tar mastic is prepared and allowed to stand in piles along the side of the road. About 17 gallons of cold tar per cubic yard of sand is used in preparing this mastic.

Dust Prevention With Calcium Chloride

The Michigan Highway Department has experimented with calcium chloride and light oils for dust prevention on gravel roads. The results with both have been satisfactory. They report the following points to be of great importance in calcium-chloride treatment: The chloride should be applied while there is still some moisture in the gravel, and the application should be in the neighborhood of from ½ to 1 pound per square yard, giving a light treatment which will help avoid future trouble. The application should be uniform over the surface. The road should be left free from all lumps or piles of chloride. Ordinarily, three applications during the season is sufficient, but the second or third application should be made before the former application of material is

entirely gone. In other words, there should be a little overlap rather than a dust interval. Care should be exercised in varying the amount to be applied to the different roads or sections of roads, inasmuch as shaded portions as well as sand or clay gravel have much to do with the quantity of chloride that should be used.

Sizes of Mulch Gravel for Maintenance

Nearly every State is now maintaining most of its gravel road mileage with a mulch treatment of gravel. Various sizes and amounts are used. Little published information is available on this subject. The Michigan Department recommends the following: Replacement material should be limited to not exceeding 1 inch in size, preferably ¾-inch, with about 60 to 75 per cent of the material being retained on ⅛-inch mesh. The clay content should be held down to not over 5 per cent, and the filler should be substantial material which will help get away from the dust nuisance. The mulch should be applied in very light courses, not exceeding one inch in depth at any time, and should be applied preferably late in the season or during the spring months.

Crack-Fillers for Concrete Pavement

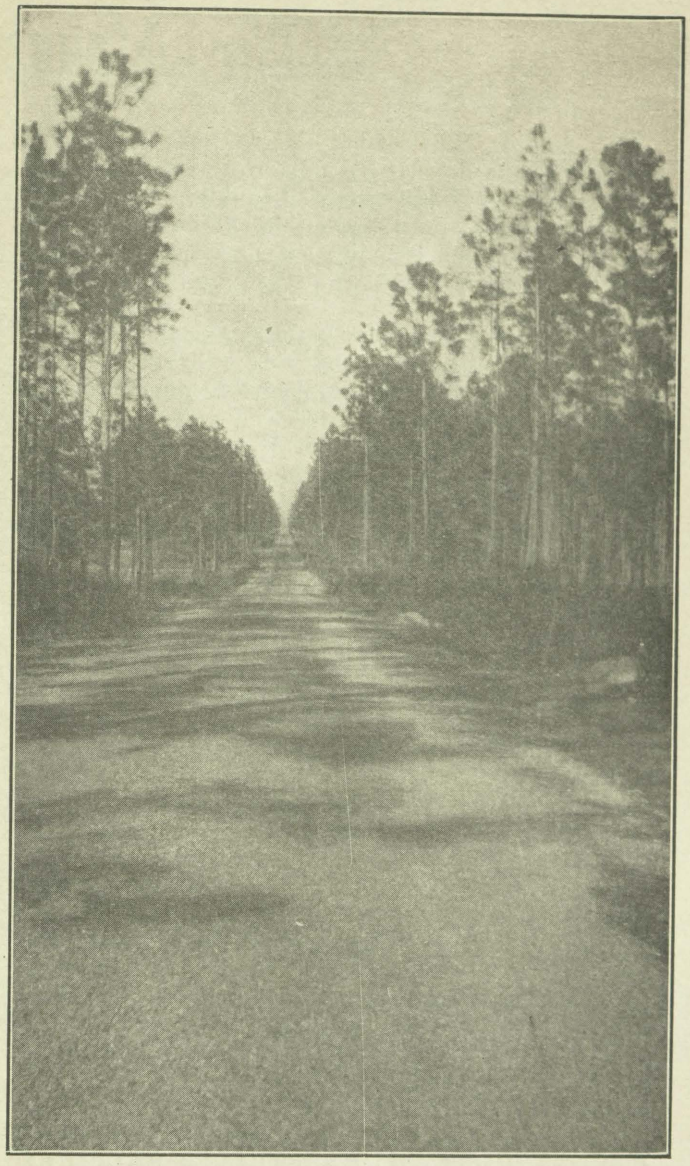
Nearly every State and numerous municipalities are experimenting more or less with various tars and asphaltic fillers for the repair of cracks in concrete pavements. A few years ago there seemed to be a demand for a light-colored filler which would harmonize with the color of the concrete pavement and thus be less noticeable than the black tars and asphalts. A satisfactory light-colored filler at a reasonable price has not been developed. The Committee of the Advisory Board on Highway Research is inclined to believe that public sentiment on this question is changing. As the mileage of concrete roads increases, the public becomes familiar with maintenance methods and does not look upon the black streaks with the horror that it did a few years ago. Furthermore, on heavily traveled pavements the oil and grease droppings from cars soon stain the pavement until the black crack-fillers are not conspicuous.

One of the most extensive tests of crack-fillers is being carried on by the Iowa Highway Commission on a concrete road immediately outside the city of Des Moines. On this experiment three tars, nine asphalts and blown oils, one emulsified asphalt and one light-colored material were used. The experiment has only recently been started. One barrel of each material has been applied and is now being tried out in service.

Maintenance Accounting

The Mississippi Valley and the American Association of State Highway Officials have committees at work undertaking to develop a feasible uniform system of maintenance accounts, so that maintenance reports of various States may be put on a comparable basis. The following report was adopted by the Mississippi Valley Association, and these States are attempting to make their accounting conform to the general classification.

(Continued on Page Twenty)



S. A. Project No. 548, Levy County, showing surface treatment as applied on lime rock base. Looking north near Eve.

WHO PAYS FOR THE ROADS

People who do not drive automobiles sometimes complain about the enormous sums of money spent on highway improvement. "The roads," they say, "cost a lot of money and car owners get most of the benefit." In a measure that is true; but it should not be forgotten that car owners pay for the roads. It is probable, indeed, that they more than pay for the roads. The Federal government, for instance, reports that it has paid out $264,782,216 on account of Federal aid highways, forest roads construction and expenses of administration. But this is not a tax on the man who does not own an automobile because the government has collected $589,012,021 in taxes on automobiles, tires and accessories. This leaves more than $3,000,000 of money paid by automobile owners to be turned into the treasury for general purposes.

It is not necessary to fight sensible appropriations for making roads for the driver pays his own way.—Farm Life.

Maintenance

The Appian Way which Caesar built has stood throughout the intervening centuries as a monument to the Highway Engineers of that day.

The highways which border the Rhine throughout Germany, although built by Napoleon over one hundred years ago are now as perfect as the day they were built.

Throughout France the highways and byways in every section, although many were built while Rome ruled the world, offer to the motorist one continuous system of almost perfect roads.

As for service, the Appian Way is today but a memory, its foundation remains, but as far as offering a suitable route for present day travel its value does not exist; while the highways of Germany and France, some built by the Romans, others by Napoleon, are perfect from the point of transportational use. The difference is maintenance.

The people of America have been converted to the cause of good roads. However, there is dissatisfaction felt in many quarters over the roads that have been built. "They do not last, they wear out." "Roads and highways that wear out in ten years are built with forty-year bonds."

Many people point to the roads of European countries and ask if it is not possible for our engineers to build roads like those, highways that never wear out. They desire their engineers to build highways that will last forever, without maintenance; such highways are not built anywhere in the world today; nor is it likely that they ever will be. There is nothing constructed by man that will not eventually yield to friction and constant pounding.

The way in which France and the other European countries make their roads—"Built with forty-year bonds"—wear for hundreds of years is as follows:

Road maintenance workers are given sections of the highway to care for, and they work constantly filling holes and ruts, and smoothing out the rough places. As a result the roads are kept in perfect condition.

During the war it was not possible for France to keep these men at work caring for the roads and consequently the highways in the war zone "wore out" and became full of chug holes and ruts. Since the war the roads of France have been repaired and the maintenance workers have again put those highways in good condition.

The American criticism that "our roads wear out" is unjust; it is true they become rough and full of holes, but if properly constructed the foundation remains as good as ever and all that is needed is maintenance.

European highways are kept in perfect condition by an efficient maintenance system. The work of the maintenance division of the State Highway Department has just begun, and reports from the various sections give evidence that the people of Texas are pleased with the start that has been made.

The roads of Texas which are built with long-term bonds will be giving good service many decades after the bonds have been paid—if the roads are constantly and properly maintained.

The State Highway Department needs and asks the cooperation of the people of Texas in carrying out its maintenance program. It will not be possible for us, on account of the vast area of our State and the comparatively small population, to maintain our highways and byways as perfectly as do the Europeans, but they can be cared for so that the investment once put in will not be lost, either to us or to posterity.—Texas Highway Bulletin.

HOGENTOGLER TO INVESTIGATE VALUE OF REINFORCEMENT IN CONCRETE PAVEMENTS

Announcement is made by Charles M. Upham, director of the Advisory Board on Highway Research of the National Research Council, that C. A. Hogentogler, of the United States Bureau of Public Roads, has been granted leave of absence in order to conduct for that board a fact-finding survey of the economic value of reinforcement in concrete pavement. This survey is to be national in scope, and will be conducted in cooperation with agencies interested in this important subject. It is proposed to cover the various soils, traffic and climatic conditions through the United States.

Mr. Hogentogler has had fifteen years of experience in highway construction and highway research, which well qualifies him to take charge of the present investigation. Mr. Hogentogler has been actively engaged in a number of important highway researches. These include the first impact and wear tests at Arlington Farms and the tests to determine the cushioning properties of tires now being conducted by the United States Bureau of Public Roads in cooperation with the Rubber Association of America and the Society of Automotive Engineers. In 1923 Mr. Hogentogler, as representative of the Bureau of Public Roads, conducted the study made in cooperation with the Advisory Board on Highway Research which resulted in the publication by the National Research Council of its Bulletin No. 35, entitled "Apparatus Used in Highway Research Projects in the United States."

Mr. Hogentogler is the author of a number of important research papers which have appeared in Public Roads and were reprinted in various technical periodicals. He is a member of the American Concrete Institute and an Associate member of the American Society of Civil Engineers.—The Dixie Highway.

The Federal aid policy accomplished far more than the mere granting of money to build good roads. It served to place the building and upkeep of public roads in the hands of trained engineering organizations by the requirements that construction of Federal aid highways must be under the direction of competent state highway departments.—Highway Engineer and Contractor.

The Lowest Responsible Bidder

The lowest responsible bidder may not be the lowest bidder at a contract letting. Often the man who bids lowest is very far from being responsible. Yet so great is the fear of many public officials of newspaper criticism that they award contracts to these irresponsible bidders merely to protect themselves against assaults from the newspapers who are often ready to charge favoritism without regard to the facts. There is a revulsion against this indefensible policy of awarding contracts to irresponsible bidders. There is a marked stiffening of the morale of engineers and officials in this matter. Many realize quite keenly that it is contrary to the public interest to overlook the bidder's responsibility.

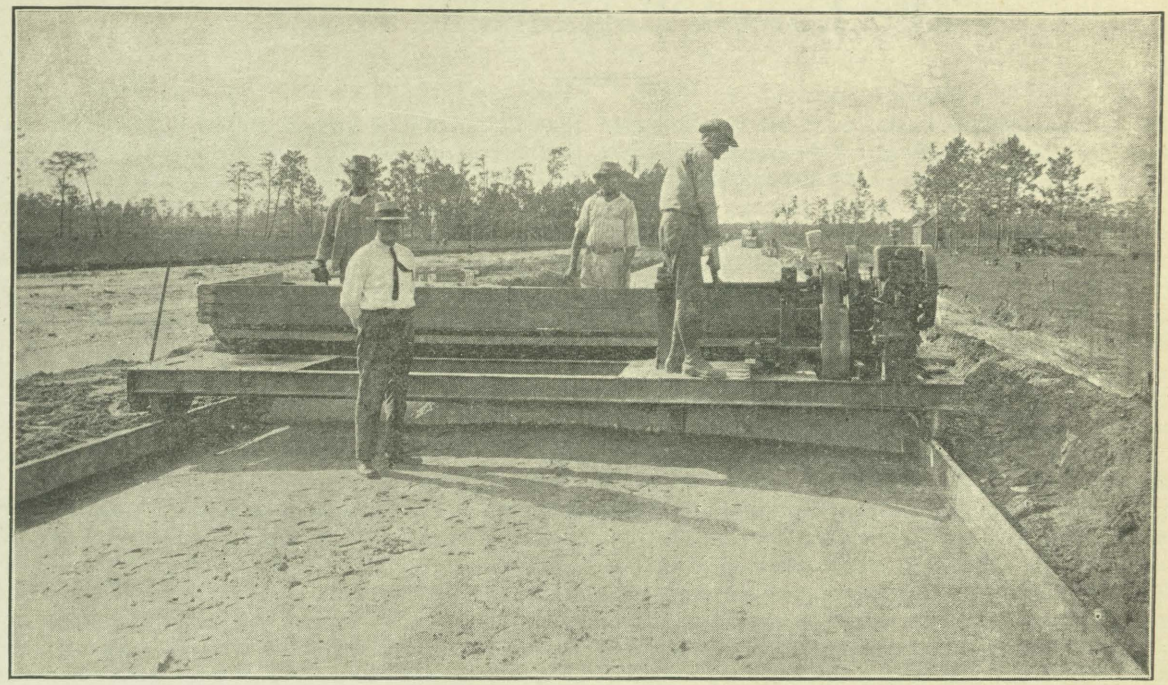
A recent statement issued by the Nevada State Highway Department said: "Every contract let by the Nevada State Highway Department contains a definite time limit for the completion of the job. Very rarely does the contractor complete the job within the time specified, and experience gained over six years of actual construction conclusively demonstrates that the major reason for the contractor's failure to complete the job on time lies in his irresponsibility when the contract was let, either through lack of proper experience, proper equipment, or being insufficiently financed. While the law allows wide discretion to the board of directors in the letting of contracts to the lowest bidder, the policy during the past has been very tolerant toward the small contractor whose responsibility might be a matter of serious doubt. In the future, however, the board is going to be very careful in this regard and the lowest bidder will have to prove beyond the question of a doubt his ability to finance properly, supervise and carry on the job and complete it on time before the contract will be let to him. The lowest bidder is not always the best bidder, all things considered, and the State Highway Department will henceforth give proper credit to the contractors who have completed their contracts within the time limit and with the least annoyance to the traveling public. The inconvenience and direct money loss to the traveling public resulting from the construction job which drags along over the time limit is very great, and in line with the policies being adopted by other States, this State will nip the matter in the bud by insuring the proper kind of a contractor when the contract is let."

Mr. G. F. Schlesinger, State highway engineer of Ohio, recently had the following to say regarding this matter: "At two recent meetings of State highway officials, the idea of traffic service to the motor traveling public was the predominating thought. A most important item in providing service to the motoring public is the minimizing of the time that an inter-county highway is out of service. To accomplish this will require the best efforts of the personnel of the Highway Department, from the directors down to the laborer on the road. While important roads are under construction, detours must be provided, often at a considerable expense. The time that the traveling public will be deprived of the use of the road under construction is vitally affected by the judgment of the Highway Commissioners in awarding contracts. It is the Commission's duty to examine carefully the experience, financial ability and general reputation of the contractor, before awarding him the contract. Unfortunately, due to criticism, that has emanated from non-technical sources, Highway Commissions in the past have not felt entirely free to select the best bidder, if he happened not to be the lowest bidder."

The right and duty of the State to make careful inquiry and fully determine the responsibility of a bidder cannot be questioned, and even the courts have severely criticised public officials who have not had due regard for this duty, as instanced by the following extract from a recent decision of the Pennsylvania Supreme Court: "The term 'lowest responsible bidder' does not mean the lowest bidder in dollars; nor does it mean the board may capriciously select a higher bidder regardless of responsibility or cost. What the law requires is the exercise of a sound discretion by the directors. They should call to their assistance the means of information at hand to form an intelligent judgment. They should investigate the bidders to learn their financial standing, reputation, experience, resources, facilities, judgment and efficiency as builders. This was not done. The court below censures the board for omitting this important step, but it holds, inasmuch as they had ample knowledge of the successful bidder and the merit of its work, the contract could be awarded. This might do in private affairs, but will not pass when public funds are at stake; it is not the exercise of discretion. Though the directors were not bound in law to give the contract to the lowest bidder, who might be irresponsible, they were bound to investigate, and if a bidder measured up to the law's requirements as a responsible party, the board could not capriciously award the contract to another. Giving a bond alone does not make up for responsibility; we have too many bonding companies willing to indemnify almost anything. But there should be a sufficient reason where a bidder is lowest and responsible, why the job was not given to him. And where such reason appears the action of the board is generally conclusive."—Indiana Highways and Motors.

CLEANING THE WINDSHIELD

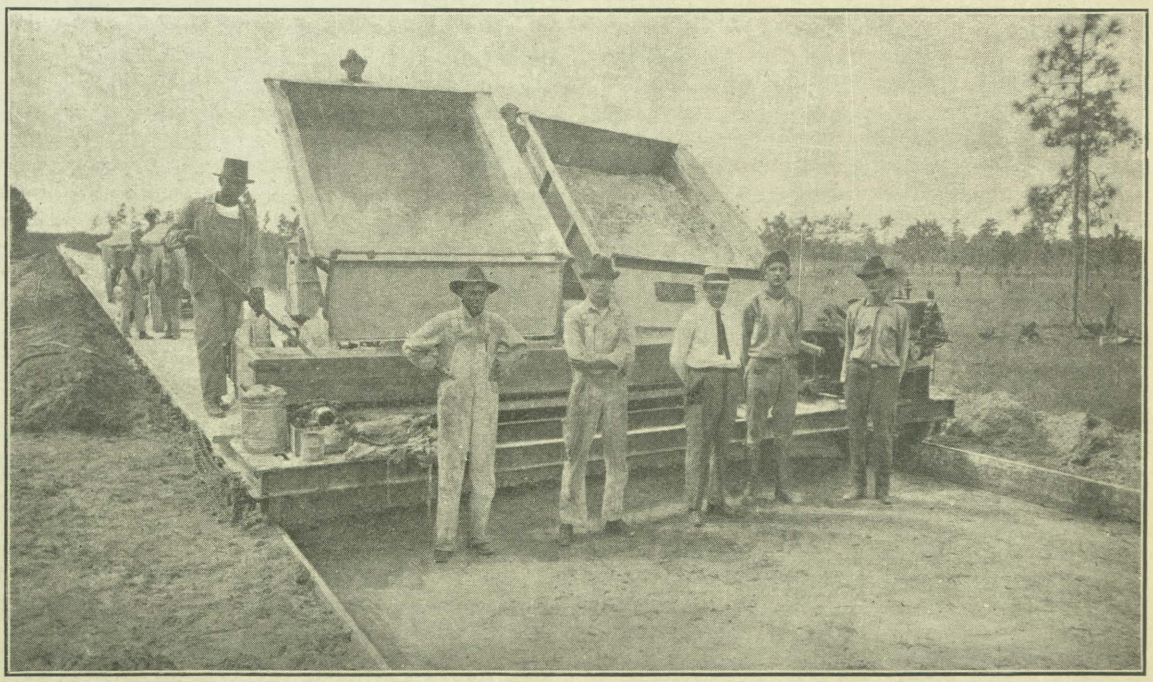
Rub a half-and-half mixture of kerosene and glycerine on the clouded surface of the glass. A small bottle of this mixture, tightly corked, may be wrapped in a little waste, put in a half-pound baking powder can, and stored away in the car. When it begins to rain pour a small portion of the mixture on the waste, rub it over the damp surface of the glass, and all water will spread out in a thin sheet wherever it comes in contact with the glycerine, instead of forming little globules, which are so detrimental to clear visibility.—Ex.



A NOVEL IDEA FOR SPREADING ROCK IN BASE CONSTRUCTION

The accompanying photographs show a new and excellent method devised by L. M. Gray, of Starke, contractor on projects Nos. 572, 594 and 607, in Bradford County. Instead of pursuing the old plan of having the trucks dump the rock on the road way and then having it spread by hand, Mr. Gray has devised the machine shown in the cuts. The rock is dumped into this machine which runs over the roadbed, dropping the rock, and spreading it to the required thickness. Its use eliminates the services of several laborers and results in a considerable saving of time in addition.

Mr. Gray has made application for patents covering his invention. He is shown in the foreground of each picture.



A Program for Fewer Deaths at Railroad Crossings

EXPRESS KILLS FOUR AS IT STRIKES AUTO AT GRADE CROSSING

Two Couples Die at New Lisbon, Leaving Eight Children Orphans

From the Newark (N. J.) Evening News, August 5, 1924.

How much longer shall we accept, as a common and almost commonplace occurrence, such accidents as the accompanying newspaper headings record? Is human life in America so cheap that the death at railroad grade crossings of four or five persons and the injury of twelve to fourteen others, as the daily average throughout the year, can stir us to no more adequate thinking and action than we have yet taken?

To be sure, railroad grade crossings are being gradually abolished. But in New York State, where the most rapid progress might reasonably be expected, some 8,000 grade crossings still exist. An important forward step has been taken by the New York legislature this year in the approval of a proposed constitutional amendment to permit the loaning of the State credit to railroads and municipalities, so that their share of the cost of eliminations may be financed in the first instance by the State, the amounts thus advanced to be repaid in annual installments; the railroads' ultimate share of the total cost being 50 per cent; the municipalities', 25 per cent; and the State assuming the remaining 25 per cent. But this constitutional amendment cannot become effective until it has received the favorable vote of the 1925 legislature and has subsequently been approved by the people; and even if thereafter elimination of grade crossings were to go forward at the rate of 200 a year—involving an annual cost, as estimated by the Public Service Commission, of $20,000,000—it would require forty years to complete the job.

Meanwhile, in New York State and elsewhere, what are we going to do about it? Until we can get rid of them entirely, how shall we render more safe the 250,000 railroad grade crossings to be found throughout the United States? To help answer this question, The American City has made a study of numerous efforts and suggestions already made, and offers the following program for the consideration of public officials, railroads and motorists:

1. At the approach to every grade crossing there should be a more adequate warning than the "Look Out for the Cars" sign inherited from the leisurely days of the horse. The motorist should know at a distance of 250 or 300 feet that he is nearing a grade crossing—and the warning should be given him by a sign of uniform and distinctive color, shape and position, the meaning of which he will instantly recognize.

2. There should be a clear view of the crossing for both the motorist and the locomotive engineer. Where obstructions exist at crossings not protected by gates, such obstructions should be removed so as to clear the field of vision for a distance of 250 to 500 feet along the road on each side of the railroad, and for 500 to 1,000 feet along the railroad itself.

3. The crossing of the highway and railroad should be approximately at right angles; the width of the roadway at the crossing should be fully as wide as the combined pavement and shoulders of the road; the surface should be smooth and approximately level for a distance of at least 50 feet on each side of the railroad; and beyond this limit approach grades should not exceed 5 per cent.

4. In addition to the advance warning sign mentioned in paragraph 1, every crossing should be provided with reliable automatic signals, giving warning to the ear by means of a gong, and to the eye, both by day and night, by a swinging or flashing sign; and also, at the more important crossings a watchman, with or without gates. It has also been suggested that in sections which are poorly lighted at night, a large electrically lighted rectangular sign carrying the word "Danger" in red letters should be suspended directly over the center of grade crossings.

5. The so-called "island" or "fool-proof" construction which provides an obstruction in the traffic stream, compelling the slowing up of traffic at grade crossings, has been tried to a limited extent, and may merit further experimentation.

6. In at least five States, traffic laws require all automobiles (with, in some cases, exceptions) to come to a full stop before crossing a railroad at grade; and such laws, much varied in detail, are in force as regards carriers for hire, in no less than sixteen States. Seven States have regulations, applicable to all automobiles, requiring a reduction of speed but not calling for a full stop.* It is obviously idle to expect a hundred per cent compliance with such laws; but the reduction in accidents which has resulted in certain cities from compelling automobiles to come to a full stop before crossing "through traffic" boulevards suggests the possibility of educating motorists more generally to treat railroad crossings with similar respect.

Instead of requiring all automobiles to stop at every railroad crossing, it has been suggested that State Highway Departments be authorized by law to designate with appropriate signs the more dangerous crossings, before which (unless protected by a watchman) a full stop shall be made; and that motorists be advised, but not required, to stop in a similar manner before all other grade crossings.

7. Interurban electric railway crossings are danger spots deserving much the same consideration as those of steam railroads.

8. To make effective the foregoing program, and any other plans for reducing the grade crossing toll, a more effective coordination of forces in each State is desirable. An opportunity for civic service of the first importance awaits the leadership, in the various States, of citizens' organizations or governmental bodies which have the energy and public confidence to become the coordinating force, be they State Cham-

(Continued on Page Twenty-Three)

A MAJOR HIGHWAY PROBLEM

The lack of proper maintenance of the vast mileage of roads outside of the Federal and State systems is one of the major highway problems of the country. The money required to do a good job is spent by various local bodies in many States. Only a very limited number of localities have, however, learned how to get fair value for their money, and fewer yet keep their local roads in good condition.

Not many realize what this whole situation involves. In the first place, it has to do with close to 80 per cent of the highways of the country. On these local highways, which almost all have unimproved surfacing, live a surprisingly large percentage of the total population. The State systems of improved roads are of little or no value to the people so situated when the local roads are impassable. Moreover, much of the hauling of farm products is done entirely over local roads. There is no prospect now that more than a very small percentage of these local roads in the chief agricultural States can be surfaced. The outlook is not much better in any other States, except where industrial districts exist. Better maintenance methods therefore offer the only means of obtaining more serviceable local roads.

Just how local officials, who change frequently and who rarely really know anything about road work, can be brought to do good maintenance work remains to be demonstrated. The money they have to spend is sufficient in many localities to do a much better job than is now done. The needs of local traffic are so great and are increasing so fast that much larger sums could be raised with comparative ease, if the local officials would show results.

The excellent maintenance work which is being done on most of the State systems is having its effect on many local officials. Most of the State roads, however, have improved surfaces. The methods used in keeping them up are not applicable to the ordinary dirt road. There also exists the conviction of most of the local officials, which is common to all rural male Americans, that they are expert road builders. Hence, it seems that it will be necessary to educate the officials unbeknown to them. At the same time the creation of powerful demands from local road users for better maintenance should produce the desired effect.

COVER PICTURE

The picture on this month's cover shows the bridge spanning the Sebastian River between Brevard and St. Lucie counties. The bridge is of concrete construction with 21 spans and in the photograph it will be seen that work is being done on the 13th span. However, at the present time, all the spans have been poured and about one-third of the hand rail has been erected.

It is proposed to build a $14,000,000 highway through Georgia as memorial to the late President Woodrow Wilson.

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ANNUAL COST

The annual cost of a highway comprises three things, namely, capital account or interest, maintenance and depreciation.

Capital Account

If the public expends $20,000 for a roadway and borrows the money to make the expenditure, it must pay a certain sum annually as interest on the borrowed money. Public highways cost from $20,000 to $40,000 per mile. Interest at 5 per cent on such sums would be $1,000 to $2,000 annually.

Maintenance

The importance of maintenance cannot be overemphasized. There is a tendency during the construction period to overlook this important phase of highway work. The railways are constructed, and the big job now is to keep them in condition for the operation of the trains. When the construction program is completed maintenance will assume even greater importance, and, if plans are not made during the construction period for the upkeep of the highways, there will be no highways to maintain when the routes are improved. Maintenance costs vary with the type of pavement from a few dollars per mile to as high as $1,200 per mile.

Depreciation

Practically all structures since the building of the pyramids have needed rebuilding. Highways are no exception to the rule. The life of an ordinary pavement ranges from five to fifteen years. This means that the major part of the improvement is temporary and must be replaced within a short period of time after the construction is completed. A $20,000 improvement may not last more than fifteen to twenty years; if so, the annual depreciation will be in the neighborhood of $1,000.

Annual Cost

Summing these three items up, the interest, maintenance and depreciation will range from $2,000 per mile to $3,600 per mile. In projecting a program for highway improvement the government unit must provide sufficient revenue to take care of these three items.

Cost of Operation

To the road user, who pays the above three items, must be added a fourth when we consider highway transportation. Not only must he pay for the maintenance and the upkeep of the roadway, but he must pay the cost of operating the vehicle. As highway transportation advances more information will be obtained about the cost of operation, and a more even balance will maintain between the first three items and the cost to get the vehicle over the road.—Tennessee Highways and Public Works.

WHERE DO WE GO FROM HERE?

We have made some progress along the way toward complete improvement of the highways of this country in the last ten years. The statistics give us credit for more than 400,000 miles of surfaced road, and nearly all of it has been improved within the decade. Perhaps it is time to ask the doughboy's question, Where do we go from here?

One thing is certain, and that is that we are going to have better roads in this country. The public demands them. There has been manifest of late some reaction against the expenditure of public funds for roads. There can be no avoiding that expenditure. With more than 15,000,000 motor vehicles now operating on our highways, additional mileage of improved highways and the maintenance of those already improved is a huge work that can neither be laid aside nor neglected. The cost of operating and maintaining these motor vehicles on the highways in their present condition will be greater than the cost of improving and maintaining the roadways so that they will be equal to the traffic demands.

In other words, with the number of motor vehicles now in operation, the public at large will pay in other ways a sum greater than the cost of improved highways if we do not improve the highways. Unless the States build them the locality must, and the voice of experience proclaims it a very foolish thing for the people of a state to decide not to support an adequate program of state road building, as a means of decreasing taxes, because it is much more likely to increase taxes.—Public Roads.

DAYTONA-OCALA HIGHWAY PROJECT BEING PUSHED

Daytona.—President Charles F. Burgman, of the Daytona Chamber of Commerce, is pursuing a campaign for establishment of the Daytona-Ocala highway, the Marion County section of which has already been provided for by bond issues, and is meeting with encouragement from all interests.

The county commissioners have agreed to have topographical surveys made of two proposed routes, which will be submitted to the Chamber of Commerce for decision. Establishment of the highway will provide practically a direct route from the Atlantic to the Gulf, cutting down the mileage to a great degree. It is believed that no more important highway project has been fostered in Florida.—Florida Times-Union.

RECORD PERIOD IN ROAD BUILDING

If proof were necessary that the United States which, thanks to the development of the motor vehicle, is now passing through the most intensive period of highway development in the history of the world, is building roads that surpass in quality anything of the kind constructed since the days of the Roman Empire, that proof is to be found in abundance.

It exists not only in the quality and quantity of American highways, but in the development of road building methods and materials. The road builders of this country have not only outstripped their ancient predecessors in the use of the most ancient materials, but are getting better results with greater speed, less labor and lower cost.—New York Tribune.

There must be a limit in weight per wheel base beyond which a motor truck will not be permitted so that a highway can be constructed with the known weight that its surface will have to sustain. This is essential.—Highway Engineer and Contractor.

ROAD MAINTENANCE PROBLEMS

(Continued from Page Thirteen)

"Expenditures by the States, through their maintenance organizations, shall be classified in their annual reports as follows:

1. Maintenance administration.
2. Maintenance proper.
3. Additions and betterments.
4. Parks, camping-grounds and roadside beautification.

"The last three classifications shall be changed to a specific section of road.

"Additions and betterments shall include expenditures for the increased permanent value of the road to accommodate traffic. This will include the cost of—

1. Increased width of surface or road-bed.
2. Increased depth of wearing surface over any previous maximum depth.
3. New guard-rails.
4. New walls.
5. New drainage structures and watercourses.
6. New subdrains.
7. Improving grades, alignment and vision."

Wisconsin has adopted the following classification:

1. Maintenance administration, covering general office overhead.
2. Maintenance supervision, covering district office overhead.
3. General maintenance, covering patrol and repair work. This cost is kept by patrol sections.
4. Reconstruction; covers replacement to restore to original condition. Cost kept by patrol sections.
5. Additions and betterments; covers expenditures which change the section of the road and produce increased capital investment.
6. Marking and signing; covers maintenance of all traffic guides on the State system.

It will be noted that these classifications can be consolidated to conform to the four main divisions of the Mississippi Valley State Highway Officials report.

When maintenance costs are kept in a uniform manner by the various States, it will be possible to make comparisons of such costs. This, however, is only the first step toward uniform maintenance reports. Maintenance reports, even though summarized from uniform records, are not of the greatest value as long as they are based on a per-mile cost. The next step is to reduce such costs to a ton-mile unit; then useful comparisons between States and between types can be undertaken. This, of course, involves traffic census data, which must be secured at regular intervals and in a uniform manner.—American City Magazine.

MOTOR VEHICLE REGISTRATION IN 1924

The Oil and Gas Journal estimates the 1924 motor vehicle registration at 19,013,100, an increase of 3,790,442 over 1923.

Nevada has equipped its state police with loadometers for the purpose of detecting overloaded motor trucks.

Contracts Awarded by State Road Department from January 1, 1924, to September 16, 1924

Contractor	Proj. No.	County	Length Miles	Length Feet	Contract Cost + 10%	Type
Bryson Const. Co	598-A	Jefferson	9.45		$44,253.00	Sand-clay
Edgar Chapman	564-A	Charlotte	10.885		92,390.03	G. & D.
L. M. Gray	572	Bradford	7.00		96,765.59	Rock
L. M. Gray	607	Bradford	5.10		70,679.12	Rock
L. M. Gray	594	Bradford	9.10		117,132.35	Rock
Ed. Pettus	563	Osceola		315	12,062.60	Bridges
J. J. Johnston	562-A	Highlands		375	11,556.60	Bridges
Higgins Const. Co	36-A	St. Lucie		72	16,322.04	Conc. Bridge
Higgins Const. Co	620	St. Lucie		45	3,672.90	Timber Bridge
Boone & Wester	564-B	Charlotte		105	11,004.40	Timber Bridge
C. T. Dawkins	37-D	Alachua		60	31,552.40	Conc. Bridge
Ocala Lime Rock	575	Putnam	5.46		39,688.00	Rock
Boone & Wester	564-B	Charlotte	9.54		73,276.28	Surf.
Sou. Pav. & Const. Co	622	Lake	.215		8,217.80	Bit. Conc. Sur.
Sou. Pav. & Const. Co	44	Lake	10.529		395,611.38	Bit. Conc. Sur.
Barber-Fortin Co	625	Citrus	10.86		195,328.35	Rock
Barber-Fortin Co	626	Citrus	6.61		106,155.48	Rock
W. J. Conners	582	Okeechobee		3,122	177,941.61	Conc. & Steel
Weeks & Jackson	562-A	Highlands	5.37		29,110.62	Bartow Clay
Mickler & McLeod	629	Highlands	6.00		40,270.23	Bartow Clay
Myers Const. Co	630	Highlands	11.00		50,356.46	Marl
Ed Pettus	534	Brevard		765	28,846.40	Timber Bridge
Ed Pettus	601	St. Johns		480	22,994.18	Timber Bridge
C. F. Lytle	636	St. Lucie	12.20		248,476.40	Rock Base
Waldeck & Deal	39-B	St. Lucie-Brevard	.25		45,562 05	Appro. Embk't.
Gillespie & North	545	Hernando		185	8,302.25	Ov'head Xing
Total			119.56	5,524	$1,977,528.52	

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And every automobile produced today is a good automobile, economically serving business and recreation needs of people in every station of life.

But there is an obstacle standing in the way of its maximum service to owners.

For while the automobile industry made paved highways an economic necessity, the mileage of such roads is today years behind the requirements of modern traffic.

Happily motorists everywhere are boosting for more and wider paved highways.

And extensive experience has taught them that Concrete Highways are one of the best all-around investments they can make—an investment that pays big dividends.

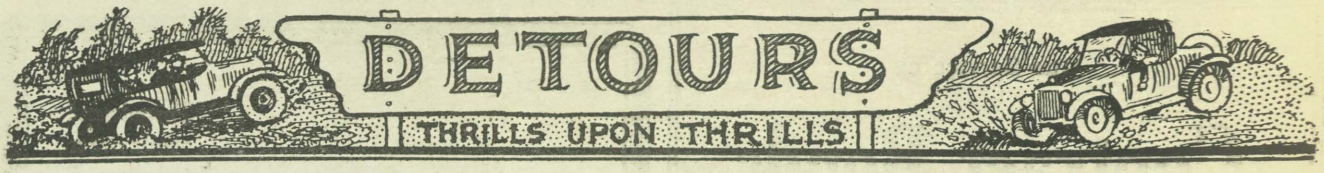
As one of our 16,000,000 motorists you know better than anyone else the need for more and wider Concrete Roads. Start now to help your local officials provide them.

PORTLAND CEMENT ASSOCIATION

Graham Building
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A National Organization to Improve and Extend the Uses of Concrete

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Still to Come

Many improvements are noted in sports model automobiles, but a fortune awaits the designer of one guaranteed to get over the railroad crossing after the gates are down.—Life.

You're Wrong, Isabel

Isabel, age 9, had just been told the story of Daniel in the lion's den. Then mother asked, "And what do you think Daniel did the very first thing after he was saved from the lions?"

Without much hesitation, Isabel replied, "Why, he must have telephoned home to his wife to tell her he was all right."—Selected.

Same Here

The chairman of the gas company was making a popular address. "Think of the good the gas company has done," he cried. "If I were permitted a pun, I would say in the words of the immortal poet, 'Honor the Light Brigade.'"

Voice of a consumer from the audience: "Oh, what a charge they made!"—Toronto Telegram.

A Sadder Sort.—Native—"Be ye tourists?"
Weary Motorist—"No; detourists."—Life.

ROAD BRIEFS

$2,000,000 IN BOND ISSUES PLANNED FOR ROADS

Clearwater, Fla.—Bond issues for road construction in Pinellas County, as planned by a number of road districts, will reach a total of approximately $2,000,000. At a recent election special road and bridge district No. 3 was created and a bond issue of $630,000 voted. These bonds are now being validated by the circuit court and will be offered for sale about November 1.

Elections were held on September 16 for the creation of special road and bridge districts Nos. 4, 5, 6 and 8, and to vote bond issues of $400,000; $45,000, $198,000 and $520,000, respectively. An election will also be held for creating special road and bridge district No. 7, and for voting bonds, but the date of election and amount of bonds have not been determined.—Manufacturers Record.

Lee Hagen and George F. Eubanks of Atlanta drove from that city to Sarasota, a distance of 700 miles, in 21 hours during the early part of this month. Leaving Atlanta in a Buick sedan at 1 a. m., the men drove down through Macon, Valdosta, High Springs, Gainesville, Ocala, Dade City, Plant City, and followed the Parrish road through Manatee to Sarasota, arriving there at 10 o'clock that night. The average speed of the trip was 32 miles an hour.—Sarasota Times.

American Road Builders' Association Convention and Show, Chicago, Jan. 6-9, 1925.

A New Alibi

Irate Wife—"John, you've kept dinner waiting."
Meek Husband—"Yes, dear, but I had to walk to where my car was parked tonight, there wasn't a taxi in sight."—The Hoosier Motorist.

One day with another through life, a man is more contrary than a woman. Any woman will tell you it is so.—The Earth.



The Austin-Western Road Machinery Company Leaning Wheel Grader. Described in advertisement on inside of back cover page.

Ocala Lime Rock--Florida's Natural Road Material

E. W. ELLIS, President. C. G. ROSE, Sec'y-Treas.

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Telegraph: Ocala. Phone 264.

ROAD MAINTENANCE EXPENDITURES

(Continued from Page Three)

are less than 8 per cent of the total mileage of all highways. The point to be given attention, however, does not lie in refinement of analysis, which the general figures available do not justify, but is the magnitude of the total maintenance expenditure. This puts highway upkeep among big business operations. It needs remembering, too, that it is a continuing business and a growing business and the part of the highway business most in danger of coming under political direction unless the situation is made clearly known to the road-using public.—The Highway Magazine.

A PROGRAM FOR FEWER DEATHS

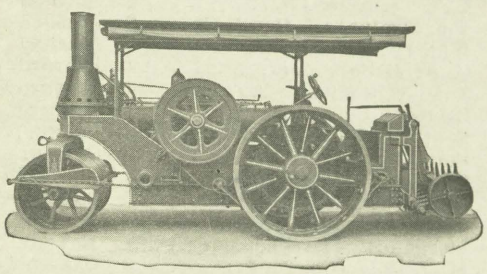
(Continued from Page Seventeen)

bers of Commerce, State Automobile Associations, State Highway Commissions, State Railroad or Public Service Commissions, or State Leagues of Municipalities. Such a State-wide movement might well have a three-fold object: (a) more rapid elimination of grade crossings; (b) increased protection at existing crossings; and (c) more effective education of motorists in common sense as expressed in the American Railway Association's new poster—"Wait, You May Lose."—American City Magazine.

*For an analysis of the various State laws regulating vehicles at crossings, and an editorial on "Lawmakers' Efforts to Make Crossings Safe," see the Railway Age for November 3, 1923.

BUFFALO-SPRINGFIELD
ROLLERS

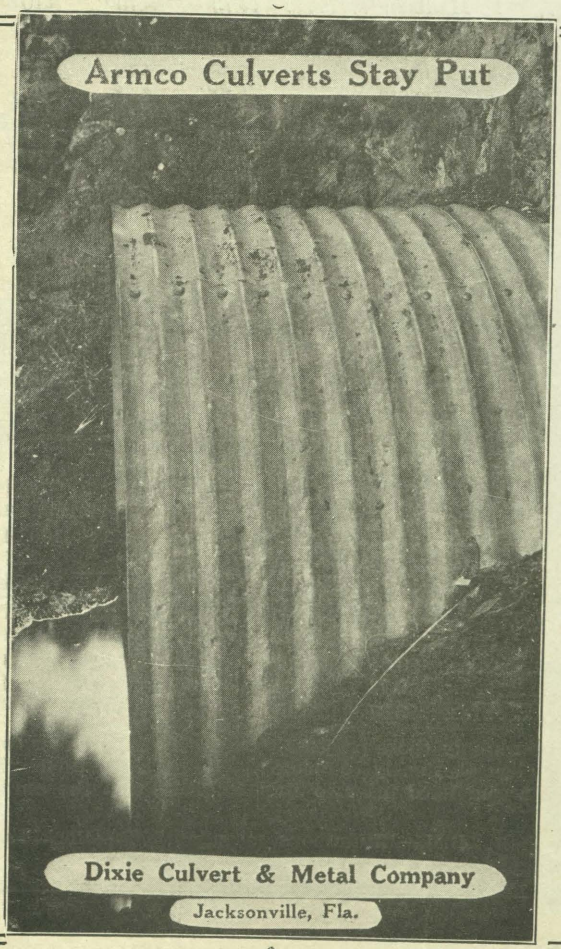
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INSTALLED
1912
UNRETOUCHED
"CLOSE-UP"
of 60-inch ARMCO 52 feet long
CITY OF
DAYTONA, FLORIDA



INSPECTED
1923
Condition Pronounced
EXCELLENT
By
W. R. BABINGTON,
Superintendent Streets,
in September, 1923, after cleaning out a few inches of sand

Status of Road Construction

DATE JULY, 1924.

Project No.	Contractor.	Road No.	County	Total Length Miles	Clearing Miles	Grading Miles	Base Miles	Surface Miles	Type	Per Cent Complete
18	Morgan-Hill Paving Co	3	Putnam	12.80	12.80	12.80	12.80	12.80	B.M.	100.00
34	Union Indemnity Co	7	Escambia	10.00	10.00	10.00		9.60	C.	96.3
36-A	H. L. Clark & Sons	4	St. Lucie	7.76	7.76	7.68	7.60	6.21	B.M.	90.00
36-B	C. F. Lytle	4	St. Lucie	7.12	7.12	6.41		4.21	C.	58.00
37-A	F. W. Long & Co	2	Alachua	.70	.70	.70	.70	0.00	S.A.	58.00
37-C	F. W. Long & Co	2	Alachua	3.26	3.26	3.26	3.26	0.00	S.A.	62.00
37-D	Fla. Drainage & Const. Co.	2	Alachua	2.14	0.00	.59			G.	28.00
37-E	Wm. P. McDonald Const. Co.	2	Alachua	7.96	7.64	7.88	7.92	5.17	S.A.	82.00
40-A	C. F. Lytle	4	Brevard	16.17	12.13	3.72	0.00		R.	11.30
40-D	J. Y. Wilson	4	Brevard	6.72	3.69	1.68	0.00		R.	8.00
40-E	Langston Const. Co	4	Brevard	13 60	9.50	6.09	2.72		R.	22.00
44	Southern Paving Const. Co.	2	Lake	10.53	9.47	.73	0 00	0.00	B.M.	2.14
501	State Forces	6	Calhoun	41.19	41.19	41.19		40.80	S.C.	99.90
503	State Forces	2	Charlotte	20.18	20.18	20.18		19.77	S.C.	98.00
505	State Forces	2	Columbia	11.80	11.80	11.80	11.80	3.54	R.(S.T.)	94.00
519	State Forces	5	Manatee	3.50	3.50	3.46	3.50	3.50	B M.	99.00
521	Morgan-Hill Paving Co	4	Nassau	12.41	7.44	6.29	0.00		R.	20.60
523	M. J. Cole (Co. funds)	8	Okeechobee	8.75	8.75	7.50	8.75	0.00	R.(S.T.)	90.00
534-A	J. D. Donahoo & Sons	24	Brevard	2.65	2.65	1.59	0.00		R.	59.00
534-B	Noll & Noll	24	Brevard	11.85	11.85	11.85	6.99		R.	59.00
539	County Forces	5	Marion	11.30	11.30	11.30	11.30	0.00	R.(S.T.)	65.00
544-A	F. S. Whitney	5	Pasco	8.75	8.75	8.75	7 50		R.	87.20
544-B	The Barber-Fortin Co	5	Pasco	11.33	11.00	9.06	2.40		R.	59.00
545	Broadbent & Groeting	5	Hernando	9.51	9.51	9.51	5.70	1.61	S.A.	48.00
553	State Forces	2	Marion	9.15	9.15	9.15	9.15	0.00	B.M.	60.00
554	Barber-Fortin Co	4	Brevard	5.00	5.00	5.00	5.00	5.00	R.(S.T.)	100.00
560	State Forces	6	Calhoun	20.00	18.00	17.00		16.00	S.C.	85.00
562-A	Southern Surety Co	8	Highlands	5.37	5.37	5.37			G.	100.00
562-B	W. P. Kennedy Const. Co.	8	Highlands	10.71	10.71	10.71	10.71	10.71	S.A.	100.00
564-A	Edgar Chapman (Co. funds)	5	Charlotte	10.88	2.51	3.81			G.	25.00
564-B	Boone & Wester	5	Charlotte	9.86	9.86	9.86		1.30	S.C.	68.00
565	State Forces	1	Madison	15 66	15.39	15.19		5.60	S.C.	90.00
570	Morgan-Hill Paving Co	5	Manatee	3.96	3.96	3.96	3.96	3.96	B.M.	100.00
571	Hunter & Gladwell	1	Madison	14.73	8.10	8.10		.59	S.C.	48.93
572	L. M. Gray	13	Bradford	7.30	7.30	7.30	5.11		R.	73.50
574	State Forces	9	Madison	11.07	11.07	9.91		0.00	S.C.	84.00
575	State Forces	3	Putnam	5.46	5.18	4.91	5.02	.82	R.(S.T.)	79.89
576	S. T. Buchanan & Sons	5	Sarasota	5.68	4.23	3.12			G.	40.00
579	State Forces	1	Holmes	8.62	8.19	6.46		6.55	S.C.	84.40
586	State Forces	1	Jackson-Wash'ton	17.37	5.55	4.34		2.43	S.C.	48.30
594	L. M. Gray	13	Bradford	9.09	9.09	9.09	9.09		R.	100.00
597	J. Y. Wilson	4	Volusia	16.29	7.24	4.50	0.00		R.	7.00
598-A	W. J. Bryson Paving Co	1	Jefferson	9.45	7.46	5.00		0.00	S.C.	63.00
598-B	State Forces	1	Jefferson	7.80	7.41	2.73		0.00	S.C.	20.00
599	M. M. Boyd	2	DeSoto-Charlotte.	7.40	7.40	7.03		1.25	S.C.	69.00
604	C. F. Lytle	4	Volusia	7.72	1.63	.24	0.00		R.	6.20
607	L. M. Gray	13	Bradford	5.10	5.10	5.10	.56		R.	20.30
607-B	State Forces	13	Clay	5.68	2.84	0.00	0.00		R.	1.50
608	State Forces	4	Bradford	9.29	6.41	2.78	0.00		R.	10.00
612	State Forces	1	Leon	17.58	2.98	.52		0.00	S.C.	2.09
625	The Barber-Fortin Co	5	Citrus	10.86	2.17	.54	0.00		R.	2.23
626	The Barber-Fortin Co	5	Citrus	6.61	2.57	.66	0.00		R.	3.28
634	State Forces	1	Jackson	11.07	1.10	.55		0.00	S.C.	2.22

TOTAL MILES COMPLETE

	Clearing Miles.	Grading Miles.	Base Miles	Surface Miles.
Complete June 30, 1924	1053.29	1003.43	352.67	603.48
Complete July 31, 1924	35.40	22.51	15.95	17.88
Total July 31, 1924	1088.69	1025.94	368.62	621.36

	Concrete.	Brick.	S. Asphalt	Bit. Macadam	S. T. and Rock	Sand Clay	G. & D.	Total
Complete June 30, 1924	80.64	25.15	71.82	132.84	118.53	329 32	202.14	960.44
Complete July 31, 1924	2.73	0.00	1.55	4.33	12.73	10.33	.73	32.18
Total July 31, 1924	83.37	25.15	73.37	137.17	131.26	339.65	202.87	992.62

Note—The above tabulation shows only those projects that are actually under construction at the present time and does not show projects that have been previously completed. However, the table, "Total miles completed," at the foot includes all projects that have been completed prior to July 31, 1924, and the amount completed in July also. The abbreviations used are as follows:

C.—Concrete. S.A.—Sheet asphalt. B.M.—Bituminous macadam. R.—Rock base. S.C.—Sand clay. G. & D.—Graded and drained. S T.—Surfaced treated.

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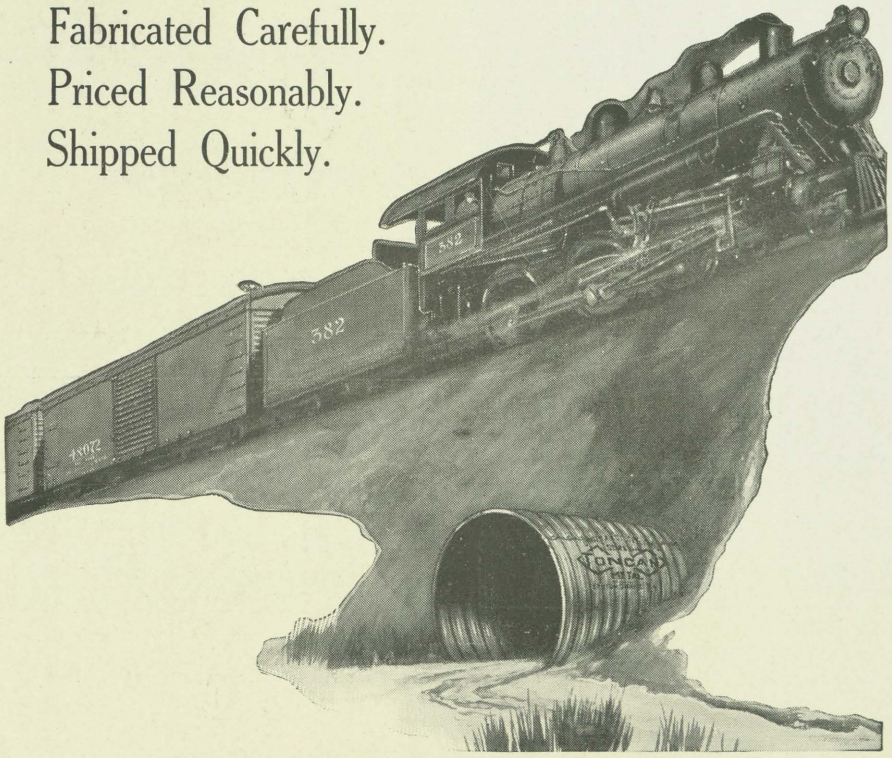
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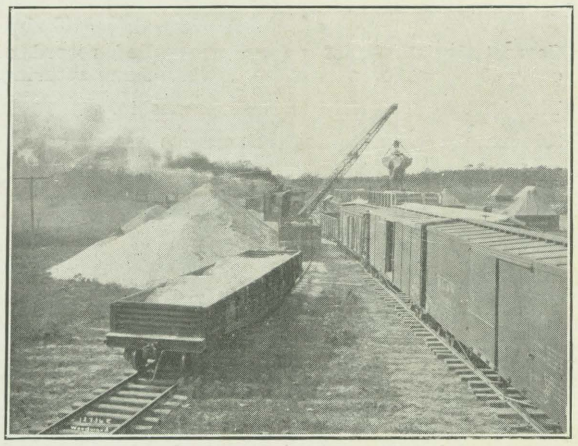
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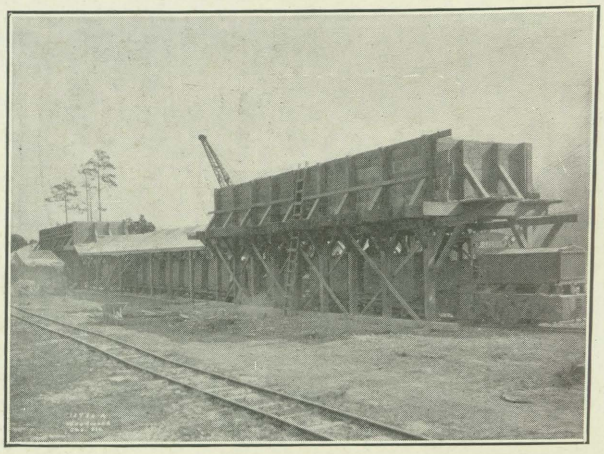
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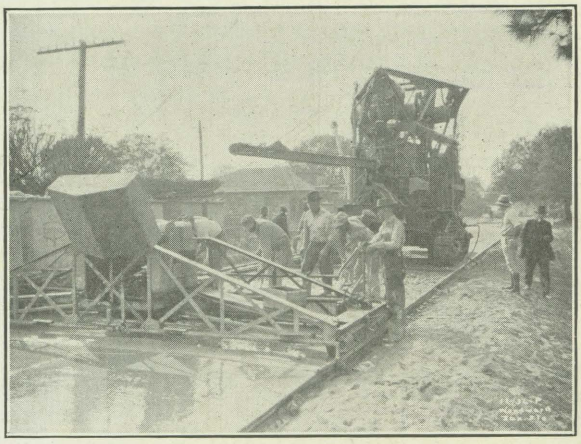
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ORGANIZATION SYSTEM SPEED

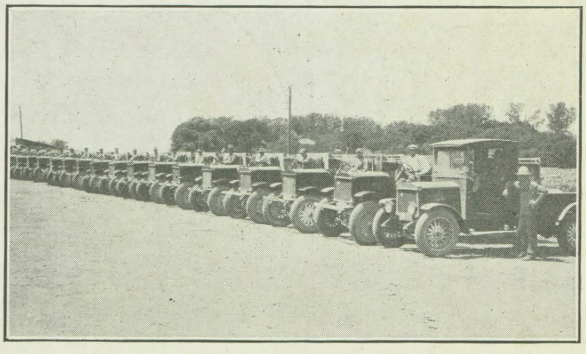


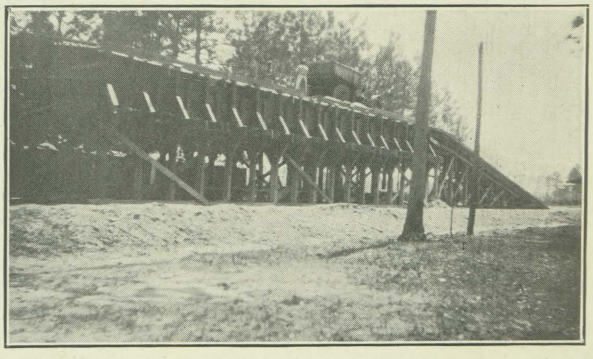


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